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Power Modular Concept PMC200

POWER RANGE 8-200 kW PER RACK



FRIEDHELM LOH GROUP

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1. Documentation Notes

The audience for this guide is the technical specialists familiar with the assembly, installation and operation of the Rittal PMC 200.

- You should read this operating guide prior to the commissioning and store the guide so it is readily accessible for subsequent use.

Rittal cannot accept any liability for damage and operational malfunctions that result from the non-observance of this guide.

1.1. Retention of the Documents

This guide and all associated documents are part of the product. They must be given to the operator of the unit and must be stored so they are available when needed.

1.2. Used Symbols

The following safety and other notes are used in this guide:

Symbol for a handling instruction:

- This bullet point indicates that you should perform an action.

Safety and other notes:



Danger!

Immediate danger to life and limb!



Warning!

Possible danger for the product and the environment!



Note!

Useful information and special features.



Heavy!

The weight is above 30 kg. Do not carry by yourself.



Heavy!

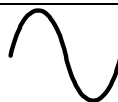
Use some aid for the transport.

Information signs:



Protective earth

A terminal that must first be connected with the earth before any other connections are wired.



Connection terminal

Terminal from which a voltage or current is directly fed or taken.



Phase

This symbol replaces the word "Phase".



ON

The main power switch is in the "ON" position.



OFF

The main power switch is in the "OFF" position.



CAUTION

Refer to the operating instructions for detailed information.



DANGER

Electrical shock danger. The warning notes must be observed.

2. Safety Notes



Danger!

Work inside the UPS system may be performed only by technicians or service partners authorised by the manufacturer.



Working on the UPS!

Read these operating instructions carefully before you start any work or action on the UPS system.

Observe the subsequent general safety notes for the installation and commissioning of the unit:

- Assembly and installation of the Rittal PMC 200, in particular for wiring the enclosures with mains power, may be performed only by a trained electrician.
- Observe the valid regulations for the electrical installation for the country in which the unit is installed and operated, and the national regulations for accident prevention. Also observe any company-internal regulations (work, operating and safety regulations).
- Prior to working at the Rittal PMC 200 system, it must be disconnected from the power supply and protected against being switched on again.
- An electrical test must be performed after the completion of the assembly, installation and maintenance work! All electrical connections must be inspected.
- Use only genuine or recommended Rittal products and Rittal accessories as spare parts. The use of other parts can void the liability for any resulting consequences.
- Do not make any changes to the Rittal PMC 200 not described in this guide or in the associated guides.
- The operational safety of the unit is guaranteed only for its approved use. The limit values stated in the Operational Area section may not be exceeded under any circumstances. In particular, this applies to the permitted ambient temperature range and to the permitted IP protection category. Please contact Rittal or an authorised

service partner for applications that require a higher IP degree of protection.

- Operation of the Rittal PMC 200 system in direct contact with water, aggressive media, or inflammable gases and fumes is prohibited under all circumstances.
- In addition to these safety notes, the special safety notes contained in the individual chapters must also be observed for individual tasks.
- The UPS system operates using mains, battery or bypass power. The individual components conduct high voltages and currents. A correctly installed UPS system is earthed and the IP20 housing is protected from electrical effects and foreign objects. The installation and maintenance work may be performed only by technicians or service partners authorised by the manufacturer.

3. Introduction

In those areas that do not tolerate any downtimes, it is very important to ensure the continuous availability of the power supply. The meeting of the requirements made by dynamic IT and process-oriented areas continually subject to changes caused by new server technologies, migration and centralisation, requires very robust and easily adaptable power supply protection concepts.

The PMC 200 is the basis for a continuous availability of the power supply for mains-dependent infrastructures in company data centres in which the continuity of the business activities is very important and in process-controlled environments in which the continuity of the production is certainly important.

The UPS system continually monitors the electrical power connection and filters out surges, spikes, sags and other irregularities of the mains supply. Within an electrical installation, the UPS supplies sensitive electronic consumers with the required clean supply voltage that they require for a reliable operation. During mains power failures or other interruptions, the UPS provides the required power during the failure time to ensure an interrupt-free operation.

The PMC 200 is a Double Conversion current protection technology with high power density (HPD) in the second generation constructed using modular components which accelerates the distribution, improves the adaptability and increases the availability of the system while reducing the TCO (total cost of operation).

The PMC 200 is an on-demand architecture that connects the power rack, the current distribution unit, the battery rack as backup and the monitoring and management solutions to permit a simple selection of optimum configurations.

The PMC 200 (distributed parallel architecture) ensures continuous availability, flexibility and, at the same time, very low costs in IT environments.

These operating instructions contain detailed technical information about mechanical, electrical and environment-related services of the PMC 200 that can provide help for questions concerning the preparation of tenders and for end user requirements. The PMC 200 was designed to satisfy the more stringent standards concerning safety, EMC and other UPS requirements.

The PMC 200 is a modular plug-in concept. It offers four rack variants (housing) and seven types of PMC modules to satisfy a wide range of power supply requirements.

The MPD housings can accept the 10 kVA / 8 kW, 15 kVA / 12 kW, 20 kVA / 16 kW and 25 kVA / 20 kW MPD-DPA modules, whereas the HPD housings can accept the 30 kVA / 24 kW, 40 kVA / 32 kW und 50 kVA / 40 kW HPD-DPA modules.

4. Service and Service Address

Rittal would be happy to answer any technical questions concerning the product spectrum. You can also contact us at the following address.

Further information can be downloaded from the RimatriX5 homepage www.rimatrix5.com

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Note!

Please always indicate the item number in the reference line.



Note!

Note the type code and the serial number of the system before contacting the service department.



Note!

The code and the serial number can be found on the type plate of the system.

5. User Safety Measures

The only permitted operator functions:

- Use of the LCD control panel and the manual bypass
- Switching the UPS system on and off using the control panel (not, however, commissioning)
- Operation of additional communications interfaces:
- SNMP adaptors and their software
- Modem/GSM or modem/Ethernet adaptors and their software
- Multidrop kit for the parallel switching of the communications information between multiple enclosures

The user must observe the safety measures and may perform only described operating commands. The user must also follow the instructions contained in these operating instructions. Any non-observance of or deviation from the instructions can cause danger for the user or even the loss of the load.



Danger!

The removal of screws or the covers of the UPS system or the battery rack is prohibited. There is danger of electrical shock!



Warning

Large leakage current: Prior to connecting the UPS system, ensure that the system is earthed!



Danger!

The user must provide all input switches of the system with warning signs. The maintenance personnel must be warned about dangerous voltages. The control panel must be given the following text: "Before beginning any maintenance work on switches, ensure that the UPS system is insulated."

6. Operational Areas

The UPS system must be installed using the recommendations in these operating instructions. To operate the UPS system at maximum efficiency, the details of the operational area listed in the operating instructions must be observed. Excessive dust in the operating area can cause damage to the UPS system. The system must be protected from outdoor weather conditions and from direct sunshine. If the system is to be operated at altitudes above 1000 metres, please contact the local Rittal service. The operational area must conform to the weight, ventilation, loads and distances listed in the technical data sheet. Under no circumstances may the UPS system be installed in rooms with limited ventilation, in the vicinity of inflammable gases or in environments that do not conform to the operational area.

The basic environmental conditions of the UPS systems are:

- Ambient temperature range: 0°C to +40° C
- Recommended operational environment: +20°C to +25° C
- Maximum relative humidity: 95% (not condensing)

To control the internal component temperature, the PMC 200 requires good air circulation. Ensure that the PMC 200 has adequate clearance at the front and rear side (see Section 10.2.2).

Safety Declaration, Conformance Declaration and CE Certified

EN

7. Safety Declaration, Conformance Declaration and CE Certified

The product is CE certified and satisfies the following European regulations:

- Low-voltage regulations:
2006/95/EC
- EMC regulations:
2004/108/EC

The conformance declaration for the UPS systems harmonisation standards and guidelines in accordance with EN 62040-1-1 (safety) and EN 62040-2 (EMC) can be downloaded from the <http://www.rimatrix5.com> web page.

Safety standards:	EN 62040-1-1:2003 EN 60950-1:2001/A11:2004
Electromagnetic compatibility (EMC)	EN 62040-2:2005 EN 61000-3-2:2000 EN 6100-3-3:1995/A1:2001 EN 61000-6-2:2001 EN 61000-6-4:2001
Performance characteristic:	EN 62040-3:2001



8. System Description

The product described in this manual is a transformer-free uninterruptible power supply system (UPS system). It is a true 3-phase, double-converting on-line system using state-of-the-art technology. The PMC 200 is designed for continuous operation which protects the load with a cleanly regulated, fault- and interruption-free AC power supply.

PMC 200		PMC Plus-60	PMC Extended 100
Configuration:	Max.	3 modules (10-25 kVA) and up to 180x 7/9 Ah batteries	5 modules (10-25 kVA) without batteries
Max. connection power	kVA	75	125
Dimensions (WxHxD)	mm	600x2000x1000	600x2000x1000
Weight of the empty enclosure without modules and without batteries	kg	220	160
Weight of the enclosure with modules, without batteries	kg	292-319 (with three modules)	280-325 (with five modules)
Colours:		Front: RAL 7035 Side panels: RAL 7035	

Table 1: System overview 1

		MPD 8	MPD 12	MPD 16	MPD 20
Output rated power	kVA	10	15	20	25
Output effective power	kW	8	12	16	20
Output power for power factor $\cos\phi = 1$	kVA / kW	8/8	12/12	16/16	20/20
Variable number of 12 V blocks:		30–50	30–50	30–50	40–50
Dimensions (WxHxD)	mm	483x225x700			
Weight of the UPS module	kg	24			33
Colour		Front: RAL 7035			

Table 2: MPD module overview

PMC 200		PMC Plus-120	PMC Extend-200
Configuration:	Max.	3 modules (30-45 kVA) and up to 240x7/9 Ah batteries	5 modules (30-45 kVA) without batteries
Max. connection power	kVA	150	250
Dimensions (WxHxD)	mm	800x2000x1000	800x2000x1000
Weight of the empty enclosure without modules and without batteries	kg	270	190
Weight of the enclosure with modules, without batteries	kg	420-450 (with three modules)	440-490 (with five modules)
Colour		Front: RAL 7035 Side panels: RAL 7035	

Table 3: System overview 2

		HPD 24	HPD 32	HPD 40
Output rated power	kVA	30	40	45 ¹⁾
Output effective power	kW	24	32	40
Output power for power factor cosphi=1	kVA / kW	24/24	32/32	40/40
Possible number of 12 V blocks:		40 - 50	40 - 50	40 - 50
Dimensions (WxHxD)	mm	663x225x720		
Weight of the UPS module	kg	50	57	60
Colour		Front: RAL 7035		
1) In inverter operating mode 50 KVA / 40 kW / bypass operating mode 45 KVA / 40 kW				

Table 4: HPD module overview

8.1. "SAFE Swap" Modules

The "Safe Swap" characteristics of the modules refer to the capability to insert and remove powered electronic power modules into or from UPS enclosures in the unit without needing to disconnect the UPS system from the inverter operation. The "SAFE Swap" design so allows powered modules to be replaced without requiring a switch to bypass or interrupting operations.

8.2. Advanced Booster Technology

Traditional harmonic distortion filters (THD filters) are no longer required with this product. The advanced booster technology installed in the UPS modules provides a perfect sinusoidal input power factor of 0.99 with less than 2% harmonic current distortion THD(i) at the input. This produces an improved and more reliable operating system. This achieves savings not only for the generator selection and the transformer dimensioning, but also lower heat losses thanks to the smaller windings dimensions.

The active front booster that individually regulates each phase allows the UPS system to produce an apparently pure resistive load image compared with the mains (cosphi 1.0). The fact that the high input power factor allows the use of a minimum cable cross-section reduces the protection costs thanks to the missing apparent power. The low current distortion content results from the high input power factor and provides additional advantages:

- No additional losses in windings and cables
- No additional heating of transformers or generators with shortened maintenance time
- No overdimensioning of generators
- No false activation or operational faults for circuit-breakers
- No abnormal operating states for computers, telecommunications applications, monitors, electronic test devices, etc.
- No resonance with capacitive input power filters for correcting the power factor

8.3. Flexible Battery Management (FBM)

To reduce the battery wear during operation, the Flexible Battery Management (FBM) is integrated as standard in all Rittal UPS products. The main purpose of the FBM is to protect the battery from negative environmental effects (e.g. high temperatures or improper handling) and to prevent excessive battery wear by providing an advanced battery charging system with preventative fault diagnosis. These integrated characteristics provide advantages not only for the end users but also protect the environment. As end user, you do not need to replace the batteries as often. This brings economic advantages while protecting the environment. Last, but not least, a maintained and controlled battery in a good operating state increases the overall availability of the UPS system.

The principle advantages are:

- Ripple-free battery charging unit thanks to a separate DC-DC charging unit, independent of the main rectifier or inverter
- Variable selection of battery blocks per line (30-50 units of 12 V blocks)
- High input voltage tolerance of the UPS system increases the battery lifetime because of the lower number of battery discharging cycles
- Battery discharge protection: to protect against intermittent loads
- Proactive battery protection against improper operation or non-permitted charging voltage
- Proactive battery fault detection thanks to advanced battery diagnostic algorithm
- Battery tests chosen by the user
- Option: temperature-compensated charging behaviour to extend the battery lifetime

The FBM system so mainly extends the battery lifetime compared with traditional charging systems. In traditional on-line UPS systems, the inverter also produces battery ripple current and so causes corrosion on the battery poles.

8.4. PMC Technology – Power Modular Concept

The characteristics of the PMC Parallel Technology of this UPS system produce an N+X redundancy without a "single-point-of-failure". The products equipped with the DPA technology are completely autonomous, because the modules permit dedicated power sections, bypasses, CPUs, operating panels and even separate battery configurations for each individual module.

The PMC technology increases the reliability of the system compared with conventional parallel systems. The purpose of a parallel switching of two or more UPS systems is to automatically accept the load for the remaining plant in case of a malfunction. A traditional parallel-redundant system operates using a random or fixed master-slave relationship between the individual units. A master logic unit forwards the individual commands to the slave units. Unfortunately, this can result in a "single-point-of-failure" for the complete system should the master-slave communications interface fail and so can cause a malfunction of the complete system.

The PMC technology has been developed as multi-master logic concept, namely, with separate, independent communications buses for the control and the logic processing, that permit a capacitive system parallel connection and so provide the best-possible system availability. This leading, industrial parallel technology used only by the PMC technology permits the parallel-redundant interconnection of UPS modules by providing them always with a 100% controlled power supply. The unique distributed PMC 200 design eliminates the possible individual fault sources for traditional parallel systems and so increases exponentially the availability of the complete system.

The PMC technology allows up to ten UPS modules to be connected together to provide the parallel-redundant configuration and its load. No sensitive master logic is used in this construction. The PMC 200 technology ensures a perfect load distribution at the redundant module level using the simple interconnection of PMC 200 UPS modules.

8.5. PMC 200 Basic Configurations

The UPS systems are installed in individual freestanding enclosures. The enclosures have a uniform colour and construction form with shielding behind the doors to protect against dangerous voltages.

The following UPS system configurations are available:

UPS type	Module count	Gross weight with PMC 8 or 12 without batteries in kg	Gross weight with PMC 16 or 20 without batteries in kg			Net weight with PMC 8 or 10 without batteries in kg	Net weight with PMC 16 or 20 without batteries in kg		Net dimensions mm
PMC Plus-60	1	304	313			244	253		600x2000x1000
	2	328	346			268	286		600x2000x1000
	3	352	379			292	319		600x2000x1000
PMC Extend-100	1	244	253			184	193		600x2000x1000
	2	268	286			208	226		600x2000x1000
	3	292	319			232	259		600x2000x1000
	4	316	352			256	292		600x2000x1000
	5	340	385			280	325		600x2000x1000
UPS type	Module count	Gross weight with HPD 24 without batteries in kg	Gross weight with HPD 32 without batteries in kg	Gross weight with HPD 40 without batteries in kg		Net weight with HPD 24 without batteries in kg	Net weight with HPD 32 without batteries in kg	Net weight with HPD 40 without batteries in kg	Net dimensions mm
PMC-Plus-120	1	TBA	TBA	TBA		TBA	TBA	TBA	800x2000x1000
	2	TBA	TBA	TBA		TBA	TBA	TBA	800x2000x1000
	3	TBA	TBA	TBA		TBA	TBA	TBA	800x2000x1000
PMC Extend-200	1	300	307	310		240	247	250	800x2000x1000
	2	350	364	370		290	304	310	800x2000x1000
	3	400	421	430		340	361	370	800x2000x1000
	4	450	478	490		390	418	430	800x2000x1000
	5	500	535	550		440	475	490	800x2000x1000

Table 5: Basic configurations

8.6. Quality Standard and UPS Classification Designation

The PMC 200 will supply regulated and reliable power to your sensitive consumers for many years.

The unique and modular PMC 200 belongs to the latest generation of mid-power 3-phase UPS systems. High reliability, low operating costs and excellent electrical characteristics are only a few important advantages of the used innovative UPS technology.

The criteria and methods used at Rittal for the development and production conform to the most stringent quality standards.

The certification of the UPS satisfies the IEC 62 040-3 and VDE 0558 Part 530 standards.

The Rittal UPS systems have the **classification designation VFI-SS-111**.

8.7. Single/Parallel Module Configuration

The PMC 200 UPS has unique parallel connection characteristics.

Rittal differentiates between single and parallel modules:

A) Single modules:

When the system consists of just a single module, this is defined as being a single module configuration. This is also the case when the modules are located in different systems, such as PMC Plus-60 or PMC Extended 100 or 200.

B) Parallel modules:

A parallel module is a module that operates in parallel to other equivalent modules but is located in the same enclosure while still using the PMC technology (e.g. PMC Plus-60).



Figure 1:MPD module



Fig. 2: Parallel module concept

8.8. Single/Parallel Systems Configuration

A) Single enclosure configuration:

This configuration means that no other systems (enclosures) are operated in the chain.

B) Parallel system configuration:

The PMC Plus-60 or PMC Extend 100 or 200 can be connected in parallel and so form a multi-enclosure configuration to increase the number of parallel-connected modules (a maximum of 10 modules).



Fig. 3: Single enclosure configuration

8.9. Warranty



Warning!

The UPS can contain batteries that must be recharged for 24 hours every six months to prevent a possible exhaustive discharge. Exhaustive-discharged batteries are not covered by this warranty.

The PMC 200 is supplied with a limited warranty that covers only UPS material defects and UPS component defects in a limited time period of twelve months after the date of the initial commissioning or fifteen months after the delivery date of the UPS. The warranty does not cover the transport costs which must be borne by the customer.

Do not send any UPS material or components to Rittal without the prior written authorisation. Rittal or the next service centre will provide you with the appropriate instructions for the procedure to be followed.

The transport costs of the returned goods must be paid for in advance and a fault description must accompany the returned goods. Returned material without a fault description cannot be processed.

The warranty will be voided if the UPS was not commissioned by Rittal or personnel authorised by Rittal.

The warrant is voided for all defects caused by misuse, inadvertence, unauthorised changes or repairs, incorrect installation, inappropriate environment, accidents or incorrect manipulation and use.

If the UPS does not conform to the above-mentioned conditions during the warranty period, Rittal or an authorised service centre can replace or repair the UPS or its components as it sees fit. All replaced system parts or components become the property of Rittal or its authorised service centre.

Rittal does not accept any responsibility for the costs caused by lost profits, lost sales, equipment damage, data or software losses, claims by third parties or other.

In general, Rittal does not recommend the use of its products for life-support applications where a fault or malfunction of the Rittal product could cause a fault in the life-support units or affect the safety and efficiency. Rittal does not recommend the use of its products in direct patient care. Rittal explicitly does not sell its products for such applications if they do not include a written assurance acceptable for

Rittal that minimises the injury or damage risk that then are fully accepted by the customer and responsibility for Rittal is restricted appropriately.

8.10. Extended Warranty

The standard warranty for twelve months can be extended with an extended warranty (maintenance contract). For further information, contact the next Rittal service centre.
<http://www.rittal.de/kontakt/index.html>

9. ACCEPTANCE – TRANSPORT – STORAGE

9.1. Introduction

This chapter contains all details for the correct unpacking, assembly, cabling and connection of the UPS system.

The UPS system and its accessories will be delivered on specially constructed pallets that are easy to handle with a forklift or pallet lifting unit. The UPS system must always be transported in a vertical position and the system may never be dropped. Because the system contains batteries and is heavy, the pallets may not be stacked on each other.



Warning!

If the system is not installed immediately, the following notes must be observed:



Transport:

UPS systems and/or battery enclosures can tip. Use the transport clamps at the rear and front side to hold the enclosures. To prevent tipping danger, never tip the enclosures with an inclination angle above 10°.



Danger!

Tipping the enclosures can cause damage to the system. Such systems may then no longer be connected to the mains system!



Danger!

The heavy weight of the systems can cause severe injury to persons and damage to any objects present in the tipping area.



Storage:

The UPS system should be stored in the original packaging and the shipping carton.



Storage:

The recommended storage temperature of the UPS system and the batteries lies within the range +5°C and +40°C.



Storage:

The UPS system and the batteries must be protected from dampness <90% RF (non-condensing).

9.2. Acceptance of the UPS System and Visual Inspection

After accepting the UPS system, inspect carefully the packaging and the unpacked UPS system for any transport damage. The attached "FRAGILE" and "ARROW" "Tip&Tel" symbols on the packaging will be in an undamaged state only when the equipment was transported in a vertical position. In case of damage or possibility of damage, contact without delay:

- The transport company and
- Rittal GmbH & Co. KG

Check that the received goods agree with those on the delivery note.

The packaging of the UPS system protects the UPS against mechanical and climatic effects. To increase the dust protection, the UPS system is enclosed in a transparent foil.



Note!

Visual transport damage must be reported to the transport company immediately after receiving the goods!

Other complaints about transport damage must also be noted immediately and reported to the transport company within seven days of receiving the goods. The packaging material must be retained for further investigations.

9.3. Unpacking



Heavy!

The weight is above 30 kg. Do not carry by yourself.



Heavy!

Use some aid for the transport.



Warning!

Observe the maximum permitted floor loading during transport and at the installation location.

4b If no UPS module is provided for the system, check whether the empty UPS compartment is protected with the appropriate cover plate.

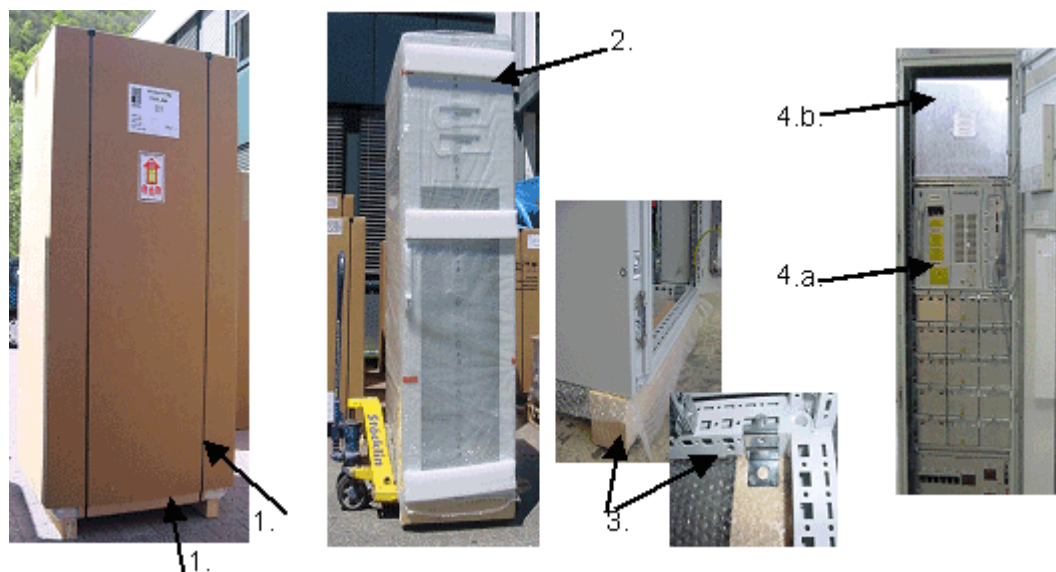


Fig. 4: Unpacking

During the unpacking, observe the "FRAGILE" and "ARROW" signs on the packaging. Ensure that the floor loading is adequate for rolling the high system weight and perform the following steps when unpacking the UPS system:

- 1 Cut the fastening tapes and pull the shipping container upwards
- 2 Remove the protective foil
- 3 Remove the transport pallet
 - Retain the packaging material for future shipping
 - Inspect the UPS for damage. In case of damage, inform the transport company or your representative immediately.
- 4a Open the UPS door and check that all UPS modules are correctly fastened in their compartments.

9.4. Type plate

The technical specifications for the complete system are specified on the front side of the UPS on an attached rating plate. Check that the data corresponds to the ordered system on the delivery note.

Serial No.								UPS Module  Made in Switzerland	Output Power	kVA	Output Power	kW
Production Date									Input voltage	V+N	Output voltage	V+N
									Input current	A	Output Freq.	Hz

Fig. 5: Rating plate

9.5. Batteries and Battery Storage



Heavy!

The weight is above 30 kg. Do not carry by yourself. Use some aid for the transport.



Warning!

Observe the maximum permitted floor loading during transport and at the installation location.

The standard batteries of the UPS system are closed, maintenance-free batteries. They are normally located in external battery enclosures connected during the commissioning. The battery lifetime is heavily dependent on the ambient temperature. The temperature range +18° C to +23° C provides an optimum battery lifetime. If the UPS was delivered without batteries, Rittal cannot accept any responsibility for damage or malfunction of the UPS caused, for example, by incorrect wiring.



Fig. 6: Batteries

9.5.1. Battery storage

The battery lifetime depends on the ambient temperature. Consequently, it is important that batteries are not stored for longer than six months at 20° C, three months at 30° C or two months at 35° C ambient temperature without recharging. For longer storage, ensure that the battery is fully recharged every six months.

Always store the batteries in their original packaging at a dry, clean and cool location. If the battery packaging has been removed, protect the batteries from dust and moisture.

Recharge the battery before and after storage.



Warning!

Closed batteries must not be stored in a discharged or partially discharged state.



Warning!

Extreme temperatures, under or over-charging, and exhaustive discharge cause damage to the batteries.

9.6. Storage of the UPS System

If the UPS is stored before it is put into operation, store the packed UPS at a dry, clean and cool location with an ambient temperature between +5° C and +40° C and a relative humidity less than 90%.

If the packaging has been removed, protect the UPS from dust and moisture.



Warning!

The UPS system, the battery enclosure and the batteries are heavy and can tip during the transport and so cause severe injury to persons and large material damage, if the instructions in the "Unpacking" section are not followed exactly.

Installation Planning and Assembly of the UPS System

EN

10. Installation Planning and Assembly of the UPS System

10.1. Planning Before the Installation

The system must be transported and sited in vertical position. The system must be accessible from the front and rear, and the rear side must remain free for the cooling air circulation. The installation room must have adequate ventilation. Because all parts of the UPS are accessible from the front and the rear, this makes the UPS easy to service and maintain. At least 600 mm space should be available at the front.

The UPS should be sited where:

- The humidity (<90% RF non-condensing) and temperature (+15° and +25° C) satisfy the specifications
- Fire protection measures are observed
- A simple cabling is possible
- Free space for service and maintenance is available at the front side
- The necessary cooling air circulation is guaranteed
- The air conditioning system has sufficient power reserves to keep the room at the required temperature
- Dust exposure and corrosive/explosive gases are not present
- The operational location is not subject to shocks
- Only access from the front is required for service and maintenance
- The floor at the installation site is flat
- If the UPS is installed in a wet-room enclosure, the appropriate separation walls must be installed
- An ambient temperature from +15° C to +25° C is recommended to ensure a long lifetime of the UPS and the batteries. The supplied cooling air for the UPS may not have a temperature above +40° C. Avoid high ambient temperatures, moisture and humidity. The floor material should be non-flammable and sufficiently stable to support the weight.

10.2. Installation of the UPS System and the Battery Enclosures

10.2.1. Transport to the Installation Site



Heavy!

The weight is above 30 kg. Do not carry by yourself. Use some aid for the transport.



Warning!

Observe the maximum permitted floor loading available during transport and at the installation location.

- Prior to the transport of the system, the permitted floor loading must be checked and a suitable aid should be used.

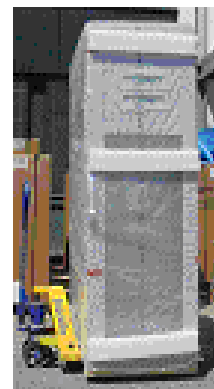


Fig. 7: Transport

The floor loading, see Section 8.5 Table 5.

10.2.2. Installation

UPS: To guarantee adequate cooling, a minimum separation of 20 cm to the rear wall is recommended. The air arrives at the front and exits at the rear side of the system. (see Fig. 8 and Fig. 9)

External battery: We recommend that the external battery enclosures are installed near the UPS system. The battery enclosures can be installed on both sides of the system. However, we recommend that they are installed on the left-hand side because the battery connections in the UPS enclosure are located at the left-hand side.

Installation Planning and Assembly of the UPS System

EN



Warning!

Prior to the installation of the system, check the battery voltage values with the UPS system.



Danger!

High direct voltages are present in the system. Only a qualified electrical technician is permitted to make the connection between the external battery enclosures and the UPS system. The external battery enclosures are connected electrically in parallel with the internal battery.



Danger!

If possible, the internal batteries should be disconnected beforehand, because the external battery terminals could short-circuit during the installation.

Battery frame: The external battery placements should be dimensioned to take account of any resulting line voltage drop. For support or help, contact your nearest service centre or representative authorised by the manufacturer.

Free space	X	Y
Minimum	200 mm	900 mm

Table 6: Separations

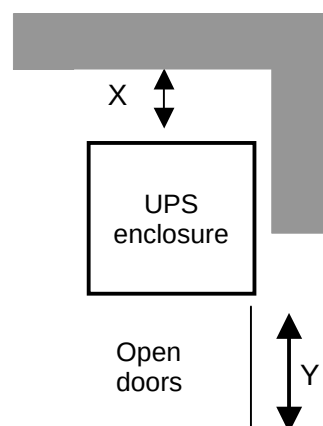


Fig. 8: UPS space requirement (recommended)

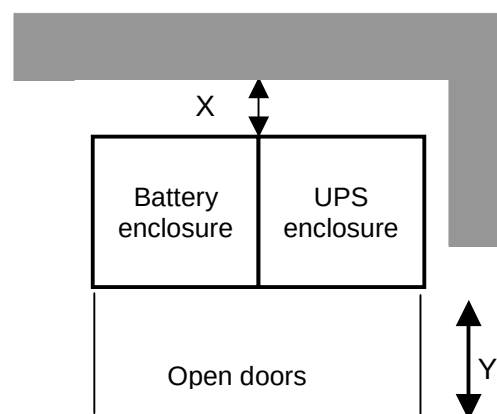


Fig. 9: UPS+battery space requirement (recommended)

11. Electrical Installation (Wiring)

The customer must prepare the mains connection for the UPS system (see Chapter 12). The electrical installation is described in the following sections. The installation and the commissioning of the UPS, the additional battery enclosures and batteries may be performed only by service technicians of the manufacturer or its contract partner.



Danger to Life!

To prevent injuries caused by electrical shocks, ensure that you follow the instructions in this manual.



Danger to Life!

All installation work described in this manual should be performed by authorised electrical technicians or by internally-qualified personnel.



Danger to Life!

No installation work of any type may be performed when water or moisture is present.



Danger to Life!

The opening of the protective cover brings you into mortal danger through contact to high voltage.



Caution, risk of death!

The non-observance of these instructions can cause severe injury or death, and damage to the UPS system or to the connected load.

To ensure the correct operation of the UPS and the supplementary equipment, the mains supply must be equipped with the appropriate protective devices (fuses). See Section 12.2.

The UPS has the following power connections:

- **Rectifier (input): 3-phase:** (1L1, 1L2, 1L3), neutral (1N) and protective earth (PE)
- **Bypass (input): 3-phase** (2L1, 2L2, 2L3), neutral (2N) and protective earth (PE). Connections for the *bypass when used as separate input (Dual Feed Input)*
- **Load (output): 3-phase** (3L1, 3L2, 3L3), neutral (3N) and protective earth (PE).
- **External battery:** **Plus (+), common (N), minus (-)** and protective earth (PE).



Warning!

A neutral conductor connection is required to ensure the correct operation of the rectifier.

11.1. Preparation of the Mains Connection



Warning!

Before starting work, first read the complete Chapter 12.



Warning!

Before connecting the device, the following items must be checked:

- The mains voltage (INPUT VOLTS) and the mains frequency (FREQUENCY) must agree with the details on the rating plate of the UPS system
- The protective earth connection must conform to the IEC standards or local regulations
- The UPS system must be supplied from a separate mains connection to the low-voltage distribution. This connection must be protected with a circuit-breaker or fuse

The input fuses and cables must be dimensioned in accordance with Section 13.2 or in accordance with IEC standards or local regulations.

The UPS input must be equipped with circuit-breakers or other protective devices. The circuit-breakers are installed between the mains supply and the UPS, and provide additional protection to the UPS in case of overload and short-circuit.

11.2. Execution of the Mains Connection



Warning!

To protect persons during the installation of the UPS, ensure that:

- No mains voltage is present
- The mains voltage cannot be switched on inadvertently
- All loads are switched off and disconnected
- The UPS system is switched off and disconnected from the power supply
- The UPS system cannot be switched on inadvertently
- The UPS modules are located in the correct slots

- The IA1 manual bypass is open and at the OFF position
- The IA2-1, IA2-2, IA2-3, IA2-4, IA2-5 (depending on the UPS type) parallel separators are at the OFF position
- Remove the covers from the connection terminals of the UPS system
- First connect the protective earth (PE) in the UPS
- Once the protective earth has been connected, connect the neutral and phase conductors. See Section 13.2.



Warning!

The phase sequence must conform to the right-hand rotary field.



Warning!

A neutral conductor connection is required to ensure the correct operation of the rectifier.



Note!

A cable clamp rail for the correct fastening of the connected cables is located below the connection terminals of the UPS.



Note!

The UPS system is equipped with two different connections: both for the separate connection of rectifier and bypass (Dual Feed Input) and also for the shared connection (Single Feed) for rectifier and bypass.

11.3. Shared Mains Connection for Rectifier and Bypass (Single Feed Input)

For the correct input wiring, refer to the drawing in Section 13.2.

For the shared mains supply, connect the mains cable to the UPS connection terminals as follows:

Mains cable	UPS terminal
L1 phase	1L1
L2 phase	1L2
L3 phase	1L3
Neutral conductor	1N
Protective earth	PE

Table 7: Terminal assignment



Note!

The recommended minimum cross-section of the input cables and fuse sizes are contained in Section 13.2.



Note!

A cable clamp rail for the correct fastening of the cables is located below the connection terminals of the UPS system.

11.4. Separate Mains Connection for Rectifier and Bypass (Dual Input Feed)

For the input wiring, refer to the drawing in Section 13.2.



Warning!

In the standard version, the UPS system is supplied with shared mains supply for bypass and rectifier.



Warning!

If a separate mains supply is required, remove the jumpers between the UPS terminals of the rectifier and those of the bypass.

UPS terminals rectifier
1L1
1L2
1L3
1N
PE

UPS terminals bypass
2L1
2L2
2L3
2N
PE

Table 8: Terminal assignment

For the separate mains supply, connect the mains cable to the UPS connection terminals as follows:

Mains connection cable	UPS terminals rectifier
L1 phase	1L1
L2 phase	1L2
L3 phase	1L3
Neutral conductor	1N
Protective earth	PE

Bypass mains connection cable	UPS terminals bypass
L1 phase	2L1
L2 phase	2L2
L3 phase	2L3
Neutral conductor	2N
Protective earth	PE

Table 9: Terminal assignment



Note!

A cable clamp rail for the correct fastening of the cables is located below the connection terminals of the UPS system.

11.5. Preparation of the Consumer Connection



Warning!

Before you connect the consumers, ensure that the sum of the UPS module rated powers (OUTPUT POWER) on the rating plates (on the front side of the UPS modules) is equal to or greater than the total consumer load.



Warning!

The UPS output must be equipped with circuit-breakers or other protective devices. The circuit-breakers are installed between the UPS and the consumers, and provide additional protection to the UPS in case of overload and short-circuit.

These circuit-breakers provide protection for each individual consumer load.

The size of the circuit-breakers depends on the provided connector.

The circuit-breakers must conform to the appropriate IEC standards. We recommend that a separate output distribution is provided for the consumers.



Note!

The following values should be specified on the output distribution:

- Maximum total load
- Maximum loading of the connectors
- If a shared distribution is used (connections for mains and UPS voltage), ensure that each connection is identified ("MAINS" or "UPS")



Warning!

The output cable cross-sections must satisfy the required cable cross-sections and fuse sizes or conform to the appropriate IEC standards or local regulations.



Note!

A cable clamp rail for the correct fastening of the cables is located below the connection terminals of the UPS.



Warning!

Ensure that the protective earth conductors conform to the IEC standards or the local regulations.

11.6. Connection of the Consumer

During the installation of the UPS, ensure that the following conditions are observed:

- No mains voltage is present
- All consumers are switched off and disconnected
- The UPS system is switched off and disconnected from the power supply

Before you connect the output cables, check that:

- All UPS modules are installed correctly and in the correct position
- The bypass switch in the OFF position is open
- All IA2 parallel separators are at the OFF position
- The cover of the UPS connection terminals is removed
- The output cable of the low-voltage distribution is connected, as shown in Chapter 13, with the output terminals of the UPS (front view of the PMC 200)

Output cable	UPS terminal
L1 phase	3L1
L2 phase	3L2
L3 phase	3L3
Neutral conductor	3N
Protective earth	PE

Table 10: Terminal assignment

11.7. Installation Checklist

- ☐ All packaging material and packaging protections have been removed from all the enclosures.
- ☐ Every UPS system enclosure has been installed at the correct location.
- ☐ All cable guides have been laid correctly to the UPS and the auxiliary enclosures.
- ☐ All cables are correctly dimensioned and connected to the correct location.
- ☐ The earth cable has been installed correctly.
- ☐ The bays on the UPS enclosure in which no modules have been inserted are provided at the front and back with protective covers.
- ☐ The battery enclosure installation notes have been observed and the installation is completed.
- ☐ The air conditioner has been installed and operates correctly.
- ☐ The immediate area of the UPS is clean and free of dust (we recommend that the UPS is installed on a twin floor also used for IT products or other electronic equipment).
- ☐ Adequate free spaces are present around the UPS system and other enclosures.
- ☐ Adequate lighting is present around the UPS system and other enclosures.
- ☐ All optional accessories have been installed and cabled correctly.
- ☐ Group alarms and/or building control systems have been wired correctly (OPTIONAL).
- ☐ The commissioning and function tests have been performed by authorised technicians.
- ☐ All network connections have been connected.

12. Block Diagrams

12.1. Wiring and Block Diagram for all UPS Enclosures and Modules



Note!

The user of the UPS system must connect it with cables to the input distributor and output distributor. The inspection of the installation, the commissioning of the UPS and the additional battery enclosures may be performed only by qualified service personnel authorised by the manufacturer.

12.2. Recommended Cable Cross-sections and Fuse Sizes

Enclosure type Terminals (T) Busbars (B)	Separate battery (+ / N / -) +PE	Shared battery (+ / N / -) +PE	Bypass input 3+N	Rectifier input 3+N+PE	Load output 3+N+PE
PMC Plus-60	9+1 x 16/25 mm ² (T)	3 x M6 (B) +PE 1 x 16 mm ² (T)	4 x 35/50 mm ² (T)	4x 35/50 mm ² (T) +PE 50 mm ² (T)	4x 35/50 mm ² (T) +PE 50 mm ² (T)
PMC Extend-100	15+1 x 16/25 mm ² (T)	3 x M10 (B) +PE 1 x 50 mm ² (T)	4 x 70/95 mm ² (T)	4 x 70/95 mm ² (T) + PE 50 mm ² (T)	4 x 70/95 mm ² (T) + PE 50 mm ² (T)
PMC Plus-120	9+1 x 16/25 mm ² (T) +PE 1 x M10 (B)	3 x M10 (B) +PE 1 x M10 (B)	3 x M10 (B) +PE 1 x M10 (B)	4 x M10 (B) +PE 1 x M10 (B)	4 x M10 (B) +PE 1 x M10 (B)
PMC Extend-200	15 x 16/25 mm ² (T) +PE 1 x M12 (B)	3 x M12 (B) +PE 1 x M12 (B)	3 x M12 (B) +PE 1 x M12 (B)	4 x M12 (B) +PE 1 x M12 (B)	4 x M12 (B) +PE 1 x M12 (B)

Table 11: Overview of the terminal connections of different UPS enclosure types

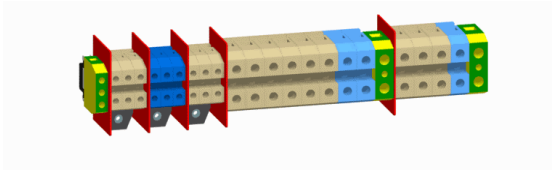


Fig. 10: PMC Plus-60

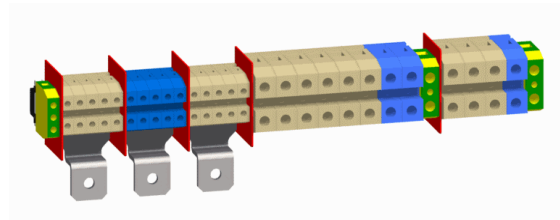


Fig. 11: PMC Extend-100

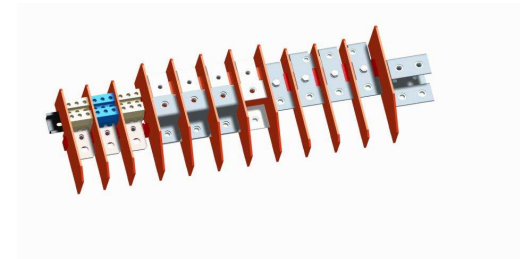


Fig. 12: PMC Plus-120

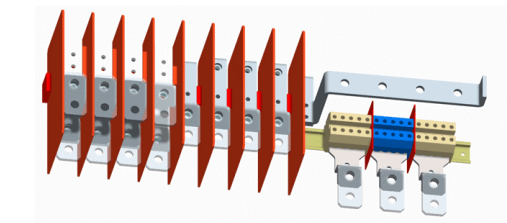


Fig. 13: PMC Extend-200, separate supply

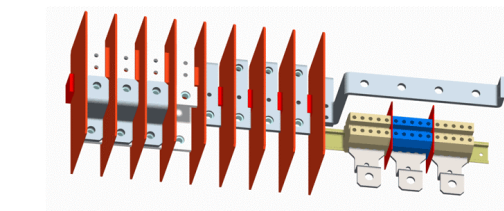


Fig. 14: PMC Extend-200, shared supply

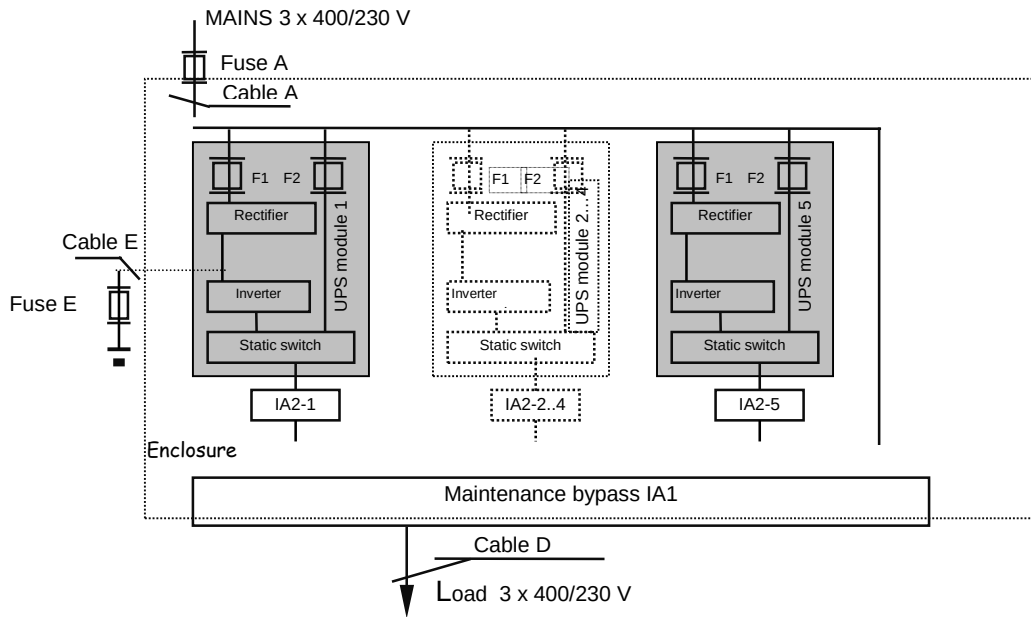
13. PMC 200 Block Diagram

13.1. Single Feed Input (Standard Version)



Note!

Cable specification and fuses are recommended values. Local standards must be observed.



Block diagram1: Standard Version (single feed input)

Enclosure type	Load in kVA at cosphi 0.8	Input 3 x 400 V			Output 3 x 400 V cosphi 0.8		Battery		
		Fuse A (Agl/CB)	Cable A (mm²) (IEC 60950-1:2001)	Max. input current with discharged battery (A)	Cable D (mm²) (IEC 60950-1:2001)	In (A)	Fuse E + / N / - (Agl/CB)	Cable E (mm²) ONLY for CBAT HPD 120 or 200 + / N / -	
								Shared battery	Separate battery
PMC Plus-60	75	3 x 125 A	5x 50	101	5x 50	108	3 x 160 A *1	3x 50	3x (3x 10)
PMC Extend-100	125	3 x 225 A	5x 95	169	5x 95	181	3 x 260 A *1	3x 120	5x (3x 10)
PMC Plus-120	150	3 x 250 A	5x 120 or 5x (2x 50)	202	5x 120 or 5x (2x 50)	218	3 x 300 A *1	3x 150	3x (3x 25)
PMC Extend-200	250	3 x 400 A	5x (2x 95)	337	5x (2x 95)	362	3 x 500 A *1	3x (2x 150)	5x (3x 25)

*1 valid only for shared battery

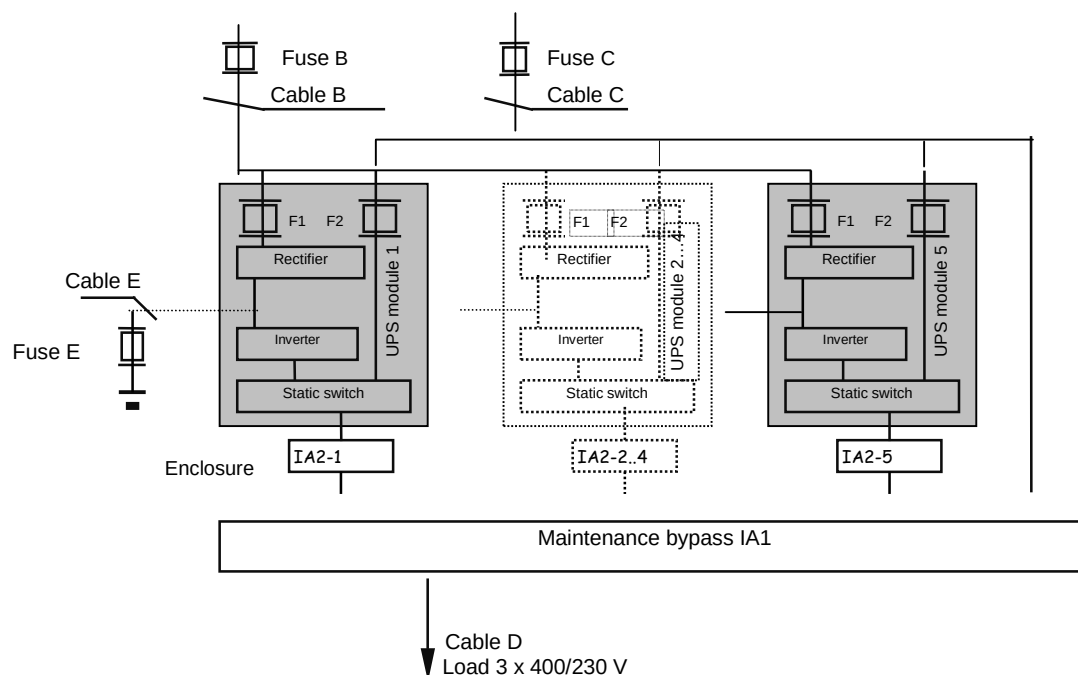
Table 12: Overview of electrical connection data

13.2. Dual Feed Input (Optional Version)



Note!

The cable selection and fuses are recommended values. Local standards must be observed.



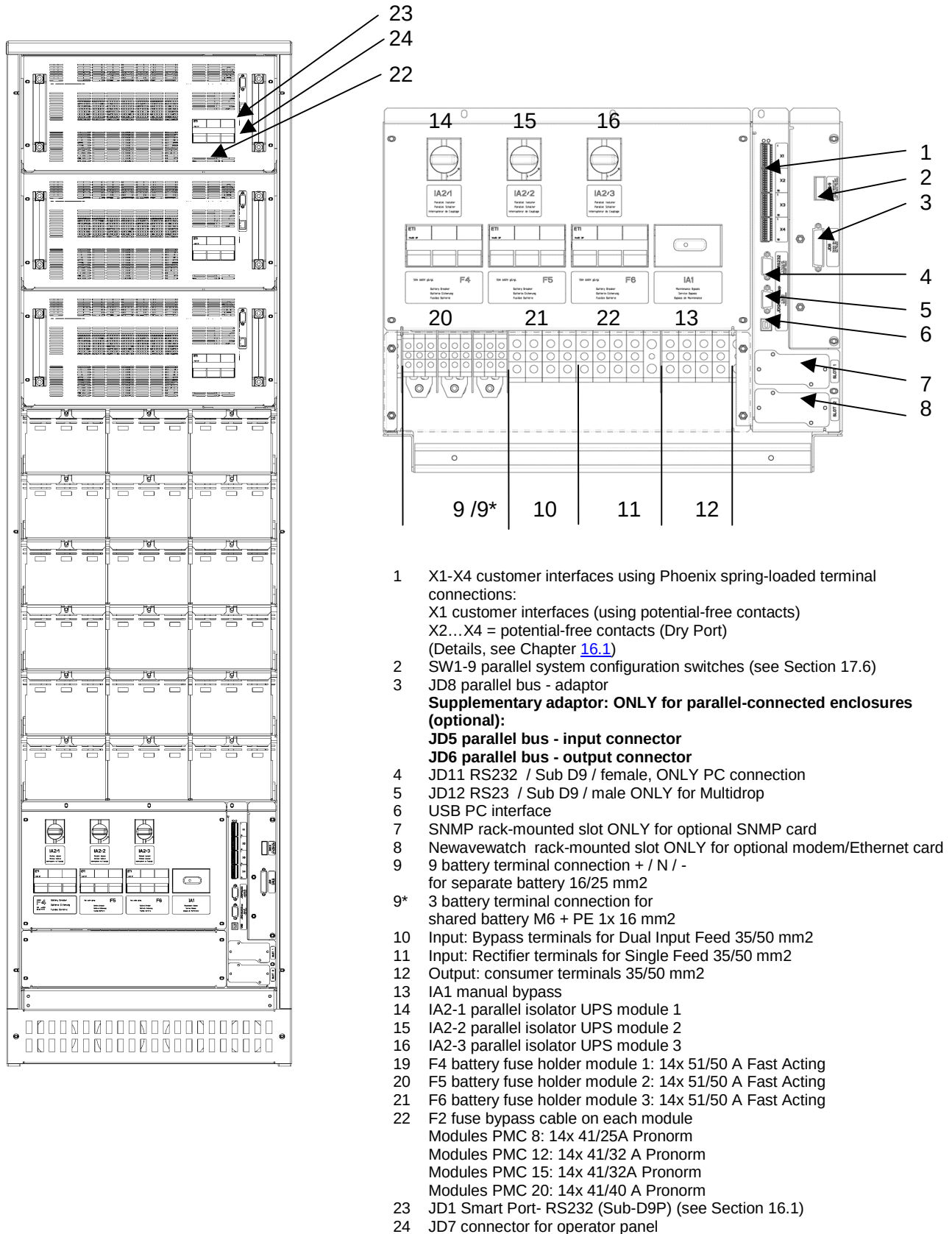
Block diagram2: Version with Dual Feed Input

Enclosure type	Load in kVA at cosphi 0.8	Input 3 x 400 V			Bypass 3 x 400 V		Output 3 x 400 V cosphi 0.8		Battery		
		Fuse B (Agl/CB)	Cable B (mm²) (IEC 60950-1:2001)	Max. input current with discharged battery (A)	Fuse C (Agl/CB)	Cable C (mm²) (IEC 60950-1:2001)	Cable D (mm²) (IEC 60950-1:2001)	In (A)	Fuse E +/N/- (Agl/CB)	Cable E (mm²) ONLY for CBAT HPD 120 or 200 + / N / -	
										Shared battery	Separate battery
PMC Plus-60	75	3x 125 A	5x 50	101	3x 125 A	4x 50	5x 50	108 A	3x 160 A*1	3x 50	3x (3x 10)
PMC Extend-100	125	3x 225 A	5x 95	169	3x 225 A	4x 95	5x 95	181 A	3x 260 A*1	3x 120	5x (3x 10)
PMC Plus-120	150	3x 250 A	5x 120 or 5x (2x 50)	202	3x 250 A	4x 120 or 4x (2x 50)	5x 120 or 5x (2x 50)	218 A	3x 300 A*1	3x 150	3x (3x 25)
PMC Extend-200	250	3x 400 A	5x (2x 95)	337	3x 400 A	4x (2x 95)	5x (2x 95)	362 A	3x 500 A*1	3x (2x 150)	5x (3x 25)

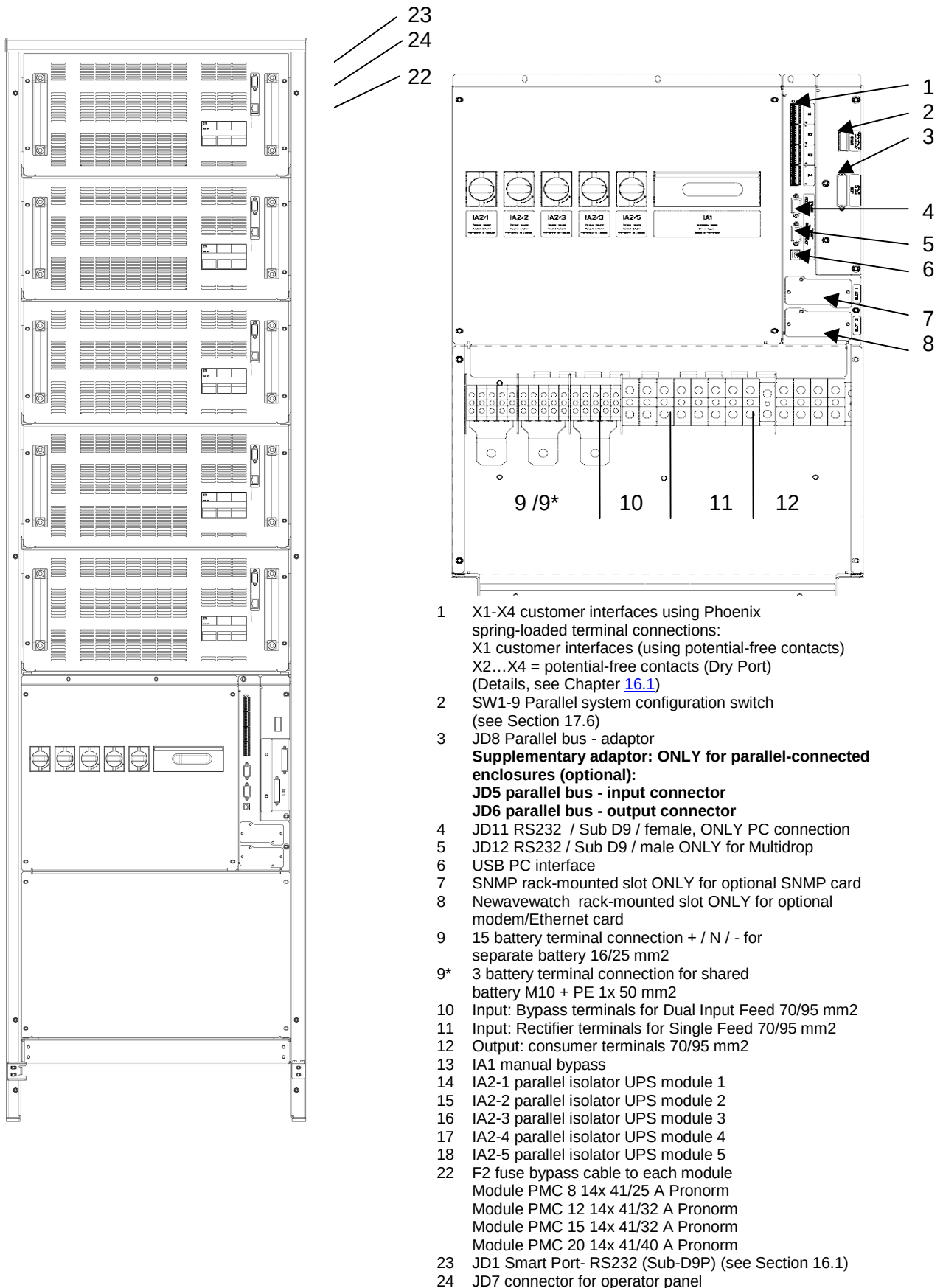
Table 13: Overview of electrical connection data

14. Front View of UPS Systems

14.1. Front View and Connection Terminals PMC Plus-60

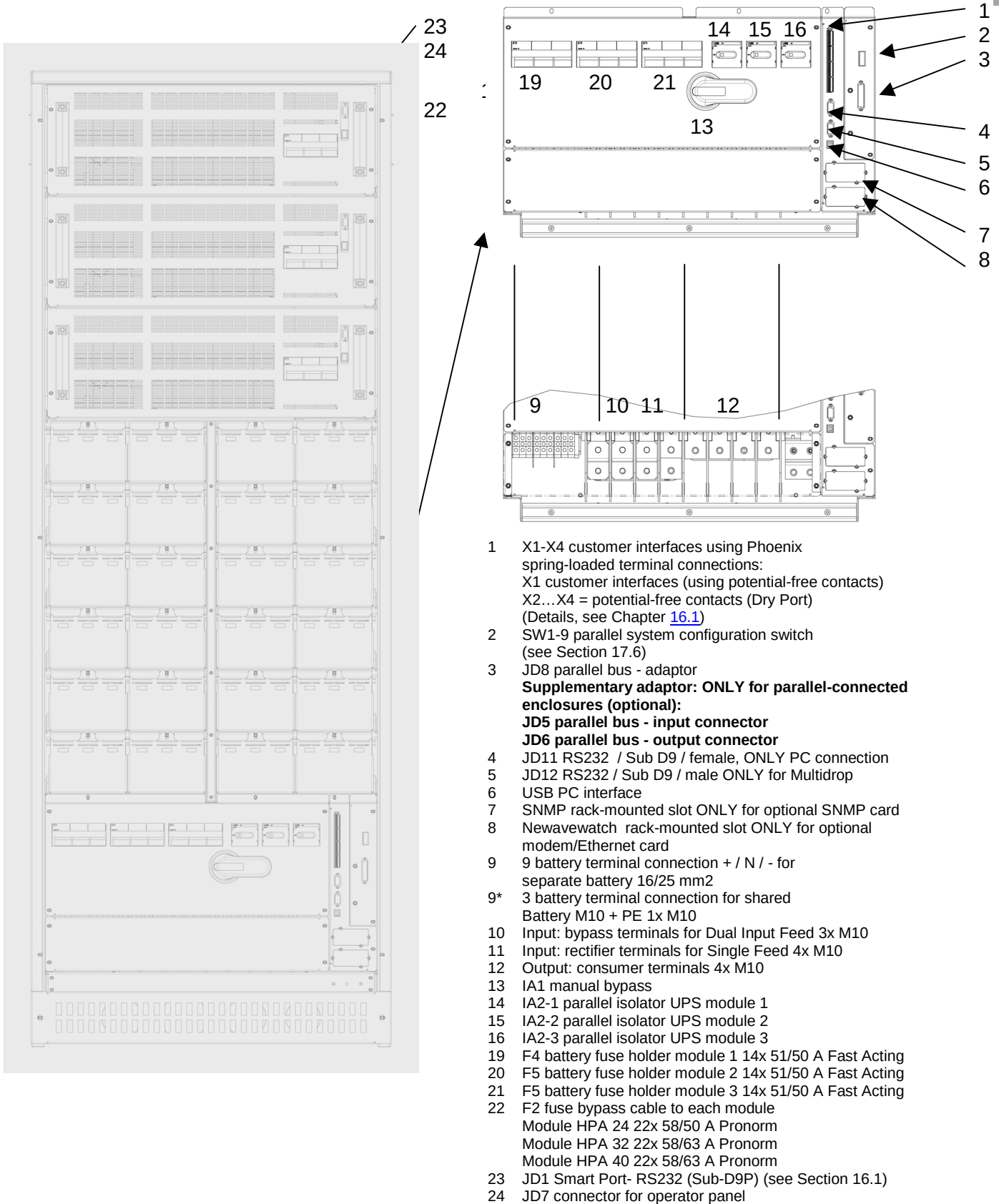


14.2. Front View and Connection Terminals PMC Extend-100

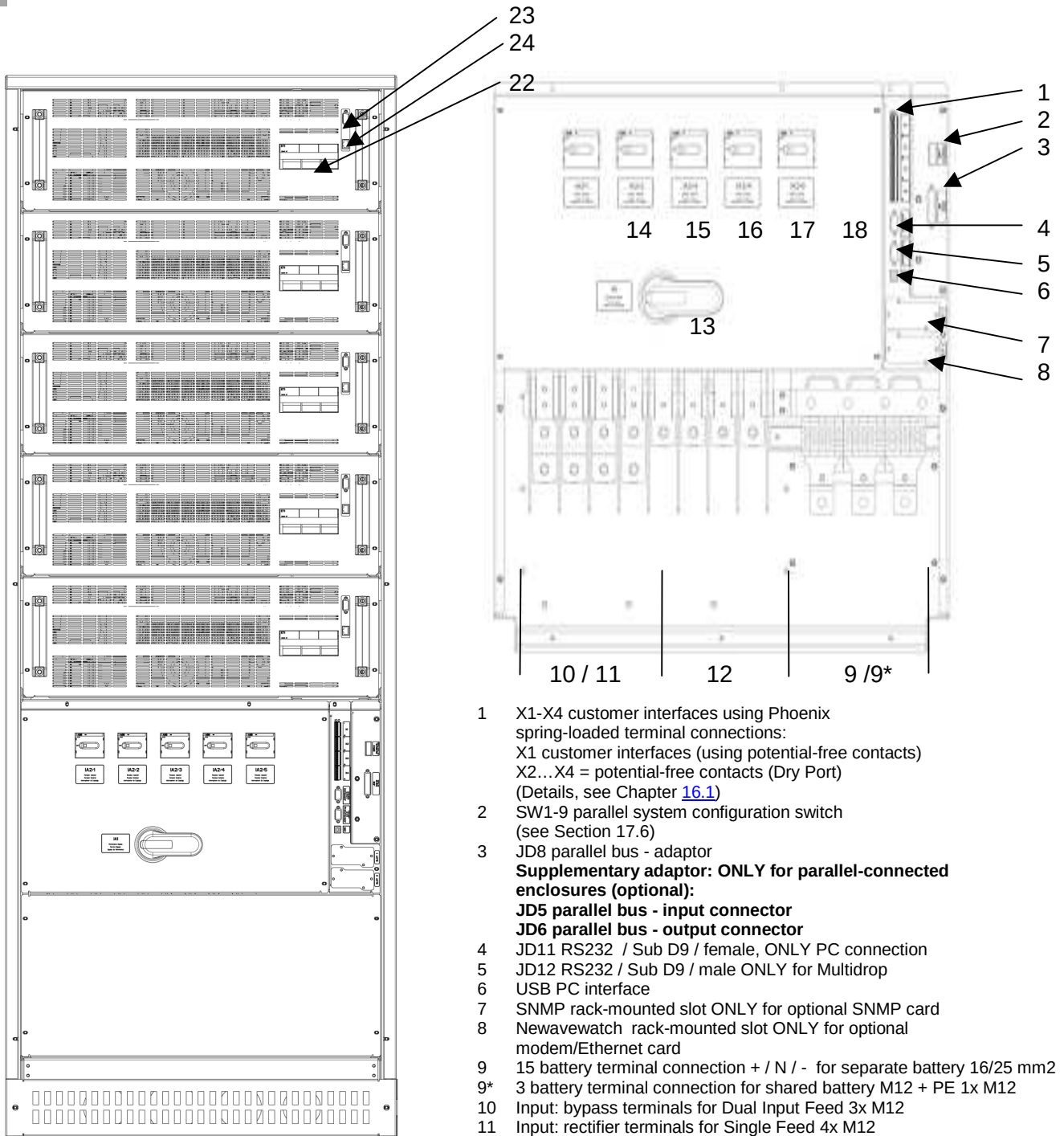


14.3. Front View and Connection Terminals PMC Extend-120

EN



14.4. Front View and Connection Terminals PMC Extend-200



- 1 X1-X4 customer interfaces using Phoenix spring-loaded terminal connections:
X1 customer interfaces (using potential-free contacts)
X2...X4 = potential-free contacts (Dry Port)
(Details, see Chapter 16.1)
- 2 SW1-9 parallel system configuration switch
(see Section 17.6)
- 3 JD8 parallel bus - adaptor
Supplementary adaptor: ONLY for parallel-connected enclosures (optional):
JD5 parallel bus - input connector
JD6 parallel bus - output connector
- 4 JD11 RS232 / Sub D9 / female, ONLY PC connection
- 5 JD12 RS232 / Sub D9 / male ONLY for Multidrop
- 6 USB PC interface
- 7 SNMP rack-mounted slot ONLY for optional SNMP card
- 8 modem/Ethernet rack-mounted slot ONLY for optional modem/Ethernet card
- 9 15 battery terminal connection + / N / - for separate battery 16/25 mm²
- 9* 3 battery terminal connection for shared battery M12 + PE 1x M12
- 10 Input: bypass terminals for Dual Input Feed 3x M12
- 11 Input: rectifier terminals for Single Feed 4x M12
- 12 Output: consumer terminals 4x M12
- 13 IA1 manual bypass
- 14 IA2-1 parallel isolator UPS module 1
- 15 IA2-2 parallel isolator UPS module 2
- 16 IA2-3 parallel isolator UPS module 3
- 17 IA2-4 parallel isolator UPS module 4
- 18 IA2-5 parallel isolator UPS module 5
- 22 F2 fuse bypass cable to each module
Module HPA 24 22x 58/50 A Pronorm
Module HPA 32 22x 58/63 A Pronorm
Module HPA 40 22x 58/63 A Pronorm
- 23 JD1 Smart Port- RS232 (Sub-D9P) (see Section 16.1)
- 24 JD7 connector for operator panel

15. Battery Configurations

15.1. Internal Battery Configuration PMC Plus-60

For the PMC Plus-60, up to 180 x 9 Ah can be provided. The figures listed below show various battery combinations.

Depending on the requirement, the batteries can be connected separately for each UPS module or connected in parallel as shared battery for all three UPS modules.



Note!

Important: For the PMC 10 kVA, PMC 15 kVA and PMC 20 kVA UPS modules, 30-50 (only an even number) 12 V battery blocks can be used for each line.



Warning!

For the PMC 25 kVA UPS modules, use only 40-50 (only an even number) 12 V battery blocks for each line.



Warning!

Important: Enter the correct number of battery blocks in the operator panel (menu: Service setup).



Note!

Other combinations are possible: See Chapter 34.

A	B	C
10x7Ah	10x7Ah	10x7Ah
2x5x7Ah	2x5x7Ah	2x5x7Ah
10x7Ah	10x7Ah	10x7Ah
10x7Ah	10x7Ah	10x7Ah
2x5x7Ah	2x5x7Ah	2x5x7Ah
10x7Ah	10x7Ah	10x7Ah
F1	F2	F3

PMC Plus - 60

Fig. 15: Combination 3x (2x 30) x7 Ah

A	B	C
10x7Ah	10x7Ah	10x7Ah
10x7Ah	10x7Ah	10x7Ah
2x5x7Ah	2x5x7Ah	2x5x7Ah
10x7Ah	10x7Ah	10x7Ah
10x7Ah	10x7Ah	10x7Ah
F1	F2	F3

PMC Plus - 60

Fig. 16: Combination (3x 50) x7 Ah

A	B	C
10x7Ah	10x7Ah	10x7Ah
10x7Ah	10x7Ah	10x7Ah
10x7Ah	10x7Ah	10x7Ah
10x7Ah	10x7Ah	10x7Ah
F1	F2	F3

PMC Plus - 60

Fig. 17: Combination (3x 40) x7 Ah

15.2. Internal Battery Configuration PMC Plus-120

For the PMC Plus-120, up to 240 x 9 Ah can be provided.

Depending on the requirement, the batteries can be connected separately for each UPS module or connected in parallel as shared battery for all three UPS modules.



Note!

Important: For the HPD 30 kVA, HPD 40 kVA and HPD 50 kVA UPS modules, 40-50 (only an even number) 12 V battery blocks can be used for each line.



Warning!

Important: Enter the correct number of battery blocks in the operator panel (menu: Service setup).



Note!

Other combinations are possible: See Chapter 34.

	A	B	C	D
	UPS 3			
	UPS 2			
	UPS 1			
6	10x7Ah	10x7Ah	10x7Ah	10x7Ah
5	10x7Ah	10x7Ah	10x7Ah	10x7Ah
4	10x7Ah	10x7Ah	10x7Ah	10x7Ah
3	10x7Ah	10x7Ah	10x7Ah	10x7Ah
2	10x7Ah	10x7Ah	10x7Ah	10x7Ah
1	10x7Ah	10x7Ah	10x7Ah	10x7Ah
				
	F1	F2	F3	

PMC Plus - 120

Fig. 18: 3x (2x 40) x7 Ah

15.3. External Battery Enclosures and Battery Connections



Danger to Life!

The dangerous direct voltages present at the battery poles can cause death.



Danger!

Protective glasses must be worn when working on the batteries!



Warning!

Because an incorrect decommissioning of the batteries can cause the production of arcs, work in the battery unit may be performed only by trained service technicians of the manufacturer or its contract partner.

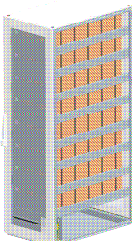
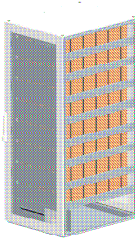
		CBAT-PMC-120	CBAT-PMC-200
Battery enclosures			
Configuration:	Max.	120 batt. blocks x 24 Ah / 28 Ah on 8 shelves 3x5=15 blocks/shelf	150 batt. blocks x 24 Ah / 28 Ah on 8 shelves 7x4 each 5 + 1x2 each 5 = 30 blocks/shelf
Battery fuses / max. batt. line: Terminals:	S-Type	3 / 3 (terminals 9 x 16/25 mm ²)	5 / 5 (terminals 15 x 16/25 mm ²)
Battery fuses / max. batt. line: Terminals:	C-Type	3 / 3 + shared connection connectors 3x (2x M8) + PE 2x M8	5 / 5 + shared connection connectors 3x (2x M10) + PE 2x M10
Protection (fast-acting)	A	3x 100 A	5x 100 A
Dimensions (WxHxD)	mm	600x2000x1000	800x2000x1000
Weight without trays and without batteries	kg	316	376

Table 14: Overview battery enclosures

Battery Configurations

15.3.1. External battery enclosure – Configurations

No space for internal batteries is provided within the Extend-100 and Extend-200.

Two identical external battery enclosures are available for such systems:

- CBAT PMC Extend-100 for separate or shared battery configuration for 24 Ah or 28 Ah blocks (max. 120 blocks)
- CBAT PMC Extend-200 for separate or shared battery configuration for 24 Ah or 28 Ah blocks (max. 200 blocks)



Note!

For detailed information and planning, see Chapter 33 and following.



Note!

For the PMC 10 kVA, PMC 15 kVA and PMC 20 kVA UPS modules, 30-50 (only an even number) 12 V battery blocks can be used for each line.



Note!

For the HPD 25 kVA, 30 kVA, 40 kVA and 50 kVA UPS modules, 40-50 (only an even number) 12 V battery blocks can be used for each line.



Warning!

Important: Enter the correct number of battery blocks in the operator panel (menu: Service setup).

For enclosures: Upgrade PMC 120 or 200 with PMC 20, HPD 24, HPD 32 or HPD 40 modules.

	A	B	C
8	5x28Ah	5x28Ah	5x28Ah
7	5x28Ah	5x28Ah	5x28Ah
6	5x28Ah	5x28Ah	5x28Ah
5	5x28Ah	5x28Ah	5x28Ah
4	5x28Ah	5x28Ah	5x28Ah
3	5x28Ah	5x28Ah	5x28Ah
2	5x28Ah	5x28Ah	5x28Ah
1			

Battery Cabinet 120

Fig. 19: Combination (3x 40) x 28 Ah

		CBAT PMC - 100	CBAT PMC - 150
Dimensions WxHxD:	mm	730x1975x800	1200x1975x800
Weight without trays and without batteries	kg	150	250

Table 15: Size and weight of battery enclosures

	A	B	C	D	E	F
8		5x28Ah	5x28Ah		5x28Ah	5x28Ah
7		5x28Ah	5x28Ah		5x28Ah	5x28Ah
6		5x28Ah	5x28Ah		5x28Ah	5x28Ah
5		5x28Ah	5x28Ah		5x28Ah	5x28Ah
4		5x28Ah	5x28Ah		5x28Ah	5x28Ah
3		5x28Ah	5x28Ah		5x28Ah	5x28Ah
2		5x28Ah	5x28Ah		5x28Ah	5x28Ah
1		5x28Ah	5x28Ah			

Battery Cabinet 150

Fig. 20: Combination (5x 40) x 28 Ah

For detailed information and planning of the battery enclosures, see Chapter 33 and following.

Example: Fig. 19 shows (3x 40) x 28 Ah installed battery blocks. The lower set 30x 24 Ah belongs to UPS 1, the middle set 30x 24 Ah belongs to UPS 2 and the upper set 30x 24 Ah belongs to UPS 3.

Figure 20 shows (5x 40) x 28 Ah installed battery blocks with each UPS module having its own 40x 24 Ah set.

Depending on the requirement, the batteries can be connected separately for each UPS module or connected in parallel as shared battery for all three UPS modules.

15.3.2. Connection of external battery enclosures for the PMC 200

We recommend for redundant multiple-module systems that each UPS module is equipped with a separate battery. This extends the redundancy also to the batteries. *Fig. 20* and *Fig. 21* show how external battery enclosures are extended using the Extend PMC UPS enclosure.



Warning!

All actions described in this manual must be performed by authorised electrical technicians or by internally-qualified personnel. Do not perform any installation work when water or moisture is present at the installation location.

The opening of the protective covers exposes voltage-conducting parts, which when touched can cause a deadly electrical shock.



Note!

If the five battery sets are to be used as shared battery for the five UPS modules, battery connection tongues, as shown below, can be installed.



Danger to Life!

To avoid injury during the installation of the UPS, ensure that:

- No mains voltage is present at the UPS system
- All consumers have been disconnected
- The UPS system and the external battery have been disconnected from the power supply

- To ensure that the PMC 200 is fully switched-off, proceed as follows:
 1. Check whether the UPS input fuses in the input distributor have been removed and the UPS is not accepting any power
 2. Check that the "MANUAL BYPASS" (IA1) is open ("OFF" position)
 3. Check that the battery fuses in the supplementary battery enclosure have been removed
 4. Protective earth connection (**PE**) between the UPS and the supplementary battery enclosure is established
 5. Check that the appropriate **+**, **N**, **-** connection terminals between the UPS and the supplementary battery enclosure are connected as shown in Figures *Fig. 20* and *Fig. 21*.

15.3.3. Connection wiring of an external separate battery for PMC 200™

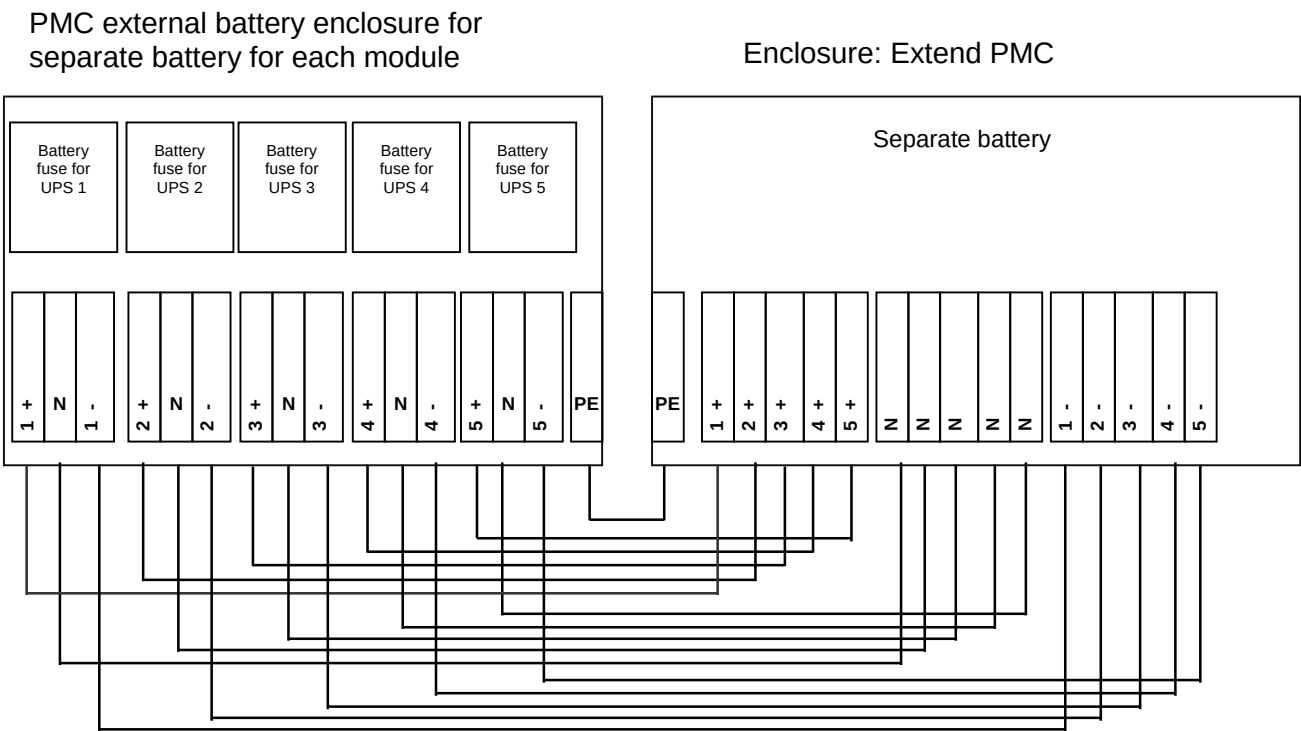


Fig. 20: Connection wiring of an external separate battery

15.3.4. Connection wiring of an external shared battery for PMC 200™

DPA external battery enclosure for shared battery

Enclosure: Extend PMC

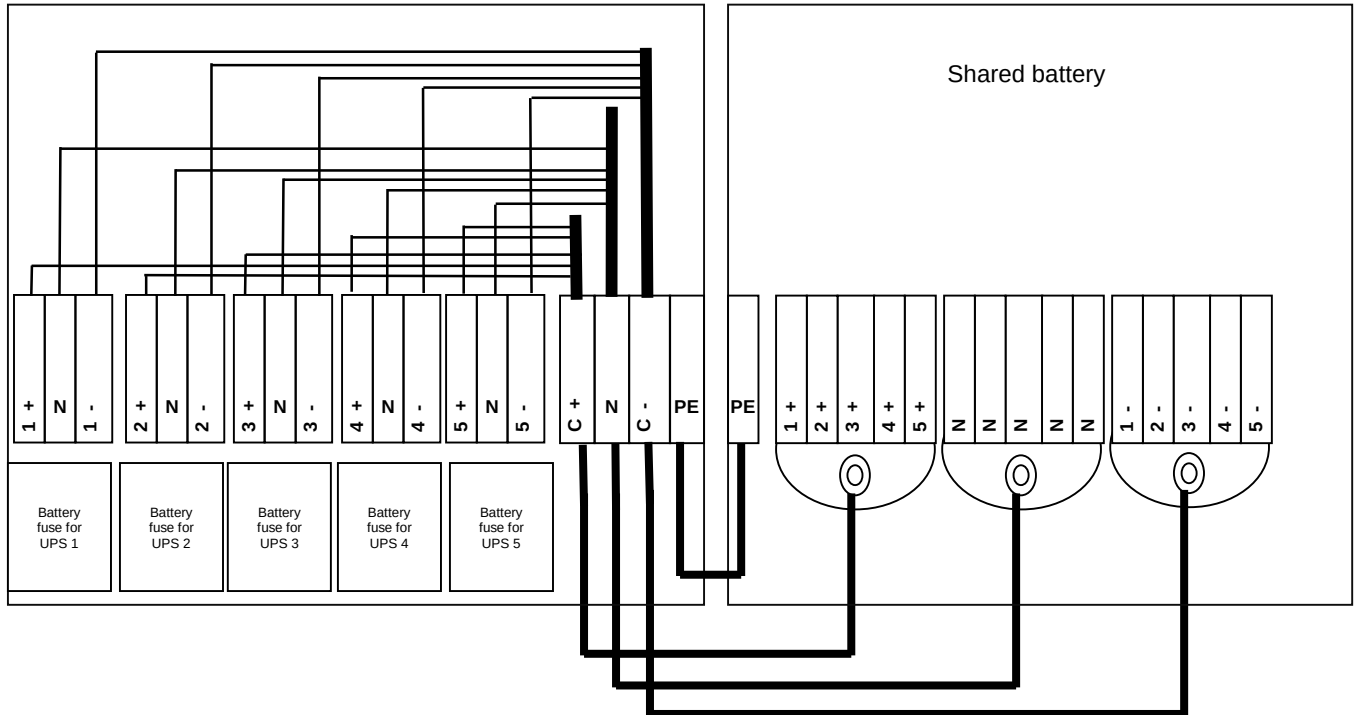


Fig. 21: Connection wiring of an external separate battery

16. Interfaces

Each UPS enclosure is equipped both with communications interfaces for each module and with a communications card that can be used to fetch system information using a PC.

On the module:

- JD1 / RS232 Sub D9 / male: SMART PORT interface (one per module)

Communications card (bottom in the enclosure next to the power distributor):

- Customer inputs: X1, potential-free contacts (Phoenix spring-loaded terminals)
- Customer outputs: X2, X3, X4 DRY PORT, potential-free contacts (Phoenix spring-loaded terminals)
- JD11 / RS232 Sub D9 / socket: interface (UPS system to the computer)
- JD12 / RS232 Sub D9 / plug: interface for Multidrop connection between several UPS enclosures
- USB interface (UPS system to the computer)

16.1. SMART PORT JD1 on Each Module (RS 232 Serial Interface / Sub D9 / Plug)

The SMART PORT JD1 found on each module is an intelligent RS 232 serial interface that allows the UPS to be connected to a PC. The connector is a standard D-Type, 9-pole plug. When the SMART PORT option is installed, the PC can use the UPS-Mon software to continually monitor the mains voltage and the UPS operating status.

If changes occur, the PC monitor will display an appropriate message (see "Monitoring Package": *UPS-Mon*).

Fig. 22 shows how a PC is connected with the UPS using **SMART PORT**.

Interface cable (UPS side)
(9-pin, D-type, plug)

Interface cable (PC side)
9-pin, D-type, socket

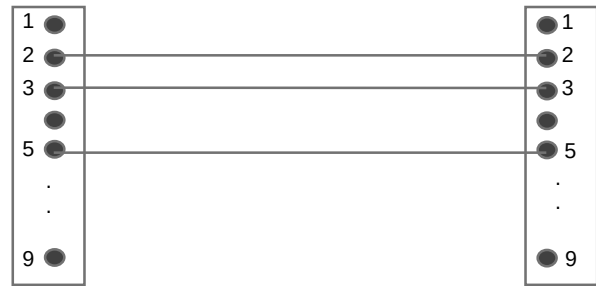


Fig. 22: Assignment for the connection cables for **SMART PORT**

16.2. Customer Interfaces and DRY PORT (Potential-free Contacts)



Note!

All customer interfaces (inputs and outputs) are connected using Phoenix spring-loaded terminals (0.5 mm² cable).

16.2.1. Customer inputs X1 terminal block



Note!

Connection of a remote emergency off unit, generator function, customer-specific inputs, temperature input for temperature-dependent battery charging (see also Chapter 23)

16.2.2. Customer outputs X2, X3, X4 terminal blocks (DRY PORT, potential-free contacts)



Note!

Signal issuance for the automatic and orderly shutdown of servers, AS400, etc.



Warning!

All potential-free contacts are designed for maximum 60 VAC and maximum 500 mA!

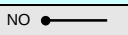
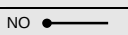
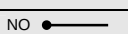
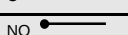
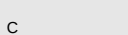
Block	Connection	Contact person	Signal	On the display	Function
X1	X1 / 1		+ 3.3 Vdc		EMERGENCY OFF (remote shutdown) (do not remove the factory-installed jumper until the external EMERGENCY OFF has been correctly wired)
	X1 / 2		GND		
	X1 / 3		+ 3.3 Vdc		Generator operation (NC = Generator ON)
	X1 / 4		GND		
	X1 / 5		+ 3.3 Vdc		Customer input IN 1 (function defined on request)
	X1 / 6		GND		
	X1 / 7		+ 3.3 Vdc		Customer input IN 2 (function defined on request)
	X1 / 8		GND		
	X1 / 9		+ 3.3 Vdc		Battery temperature input (if connected; battery charging current depends of the battery temperature)
	X1 / 10		GND		
X2	X2 / 1		ALARM	MAINS_OK	Mains is present
	X2 / 2				Mains failure
	X2 / 3				Shared cable
	X2 / 4		Message	LOAD_ON_INV	Load at inverter
	X2 / 5				(load at mains bypass)
	X2 / 6				Shared cable
	X2 / 7		ALARM	BATT_LOW	Low battery voltage
	X2 / 8				Battery OK
	X2 / 9				Weight
X3	X2 / 10		Message	LOAD_ON_MAINS	Load at bypass (mains)
	X3 / 1				(load at inverter)
	X3 / 2				Shared cable
	X3 / 3		ALARM	COMMON_ALARM	General alarm (system)
	X3 / 4				No alarm state
	X3 / 5				Shared cable
	X3 / 6		ALARM	MODUL_ALARM1	Module 1 alarm
	X3 / 7				No alarm state
	X3 / 8				Shared cable
X4	X3 / 9		ALARM	MODUL_ALARM2	Module 2 alarm
	X3 / 10				No alarm state
	X4 / 1				Shared cable
	X4 / 2		ALARM	MODUL_ALARM3	Module 3 alarm
	X4 / 3				No alarm state
	X4 / 4				Shared cable
	X4 / 5		ALARM	MODUL_ALARM4	Module 4 alarm
	X4 / 6				No alarm state
	X4 / 7				Shared cable
	X4 / 8		ALARM	MODUL_ALARM5	Module 5 alarm
	X4 / 9				No alarm state
	X4 / 10				Shared cable

Table 16: Assignment of the Phoenix spring-loaded terminal connections (X1...X4)

The interface communications card has two LEDs:

- Green LED: shows the status of the communications card:
 - o Fast flashing: twice per second = card is master (1st UPS enclosure of a system)
 - o Slow flashing: once per second = card is slave (2nd – 5th UPS enclosure systems)
- Red LED: card alarm (indicates that the card may need to be replaced)

On the master card the following contact interfaces are active:

- o Customer inputs (X1)
- o Customer outputs (X2, X3, X4)

On the slave card the following contact interfaces are active:

- o Customer outputs X3/6 ... X3/10 and X4/1 - X4/10 (alarm modules 1, 2, 3, 4, 5)



Note!

All other inputs and outputs on the slave card are not activated.

16.2.3. JD11 / RS232 PC interface

The JD11 (4) PC interface located on the side of the input/output distributor is an RS232 serial interface that can be used to connect the UPS system with a PC. The JD11 connector is a standard D-Type, 9-pole socket.

When the PC interface is installed, the PC can use the UPS-Mon software to continually monitor the mains voltage and the UPS operating status.

If changes occur, an appropriate message will be displayed. (See "Monitoring Package": UPS-Mon.).

16.2.4. JD12 / RS232 interface for Multidrop

The JD12 (5) interface located on the side of the input/output distributor is an RS-232 serial interface that can be used to request all system information for several UPS enclosures operating as a parallel group using the Multidrop kit. The JD12 connector is a standard D-Type, 9-pole plug.

16.2.5. USB/2 PC interface

The USB (6) PC interface located on the side of the input/output distributor is connected in parallel with the JD11 RS 232 serial interface.

When the USB PC interface is installed, the PC can use the UPS-Mon software to continually monitor the mains voltage and the UPS operating status.

If changes occur, an appropriate message will be displayed. (See "Monitoring Package": UPS-Mon.).

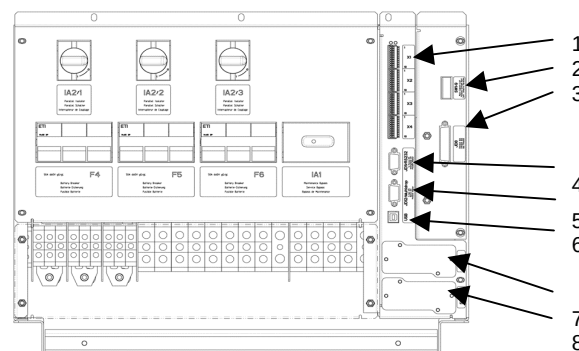


Fig. 23: Interfaces description

- 1 X1-X4 customer interfaces using Phoenix spring-loaded terminals
Connections:
X1 customer inputs (using potential-free contacts)
X2...X4 = potential-free contacts (Dry Port)
(details, see Chapter 470)
- 2 SW1-9 Parallel system configuration switch
(see Section 17.6)
- 3 JD8 Parallel bus - adaptor
Supplementary adaptor: ONLY for parallel-connected enclosures (optional):
JD5 Parallel bus - input connector
JD6 Parallel bus - output connector
- 4 JD11 RS232 / Sub D9 / socket, ONLY PC connection
- 5 JD12 RS232 / Sub D9 / connector, ONLY for Multidrop
- 6 USB PC interface
- 7 SNMP Rack-mounted slot ONLY for optional SNMP card
- 8 Rittal UPS Management
Rack-mounted slot ONLY for optional modem/Ethernet card

17. Commissioning

17.1. Commissioning



Warning!

The PMC 200 is a high-quality electronic system that must be commissioned by a Rittal-authorized service engineer before it can be handed over to the customer.



Note!

The commissioning of the UPS system involves the connection of the UPS and the battery, the checking of the electrical installation, the operational environment of the UPS, the controlled switch-on and checking of the UPS, and customer training.



Danger!

Work on the UPS system may only be performed by service technicians of the manufacturer or its contract partner.

17.2. Operator Panel



Danger!



Only persons trained by the service partner of the manufacturer or its contract partner may operate the UPS system using the operator panel with closed UPS door. All other interventions in the UPS system may only be performed by a service partner of the manufacturer.

The user-friendly operator panel consists of three parts:

- Power Management LCD Display (PMD)
- LED displays
- Control keys

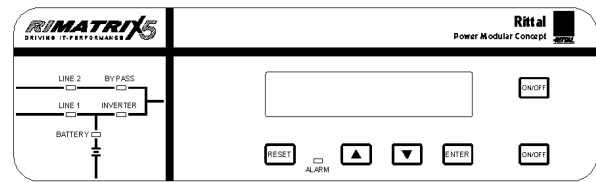


Fig. 24: Operator Panel

17.3. Power Management Display (PMD)

The LCD with two lines and twenty characters per line simplifies the communication with the UPS and displays the required monitoring data of the UPS. The display controlled using the menu permits:

- Access to the event memory
- Monitoring of voltage, current, frequency, and power of the input/output
- Battery autonomy
- Command execution such as activation and deactivation of the UPS, and switching of the load from inverter to bypass and vice versa
- Diagnosis (service mode)
- Settings and tests

17.4. LED Displays

The general state of the UPS is displayed on the mimic diagram. The LED displays show the energy flow and the appropriate display for mains power failure or load switching from inverter to bypass and vice versa. The LED colour changes from green (normal) to red (warning).

The "Line 1" LED (rectifier) and "Line 2" LED (bypass) show the availability of the mains power supply.

If the Inverter LED or the Bypass LED illuminates green, this indicates which of the two sources supplies the critical load.

If the battery is supplying the load because of mains power failure, the "Battery" LED display flashes.

The "Alarm" LED display is an optical display for any internal or external alarm state. An acoustic alarm will also be issued.

DISPLAY	DISPLAY STATUS	MEANING
ALARM	Off	No alarm state
	Red	Alarm state
LINE 1	Green	Rectifier mains supply present
	Red	Rectifier mains supply not present
LINE 2	Green	Bypass mains supply present
	Red	Bypass mains supply not correct or present
	Off	UPS switched off
BYPASS	Green	Load at bypass (bypass or eco mode)
	Red	Bypass not in operation (switched off)
INVERTER	Green	Load at inverter Inverter fault or load cannot be accepted
	Red	Inverter switched
	Off	Inverter not in operation (switched off)
BATTERY	Green	Battery OK
	Red	Battery fault or battery discharged
	Green flashing	Battery discharged or battery fuses open

Table 17: LED display overview

17.5. Control Keys

The Display control keys are used to switch the UPS system on or off, and configure it and monitor it locally.

KEYS	FUNCTION
ON/OFF ON/OFF	To switch on the UPS (press any key) or to switch off the UPS (press both keys simultaneously).
UP (↑)	Move upwards in the menu.
DOWN (↓)	Move downwards in the menu.
RESET	Resets the alarm buzzer. The LED display will also be cleared when the alarm status is no longer present, otherwise the LED display continues to illuminate red.
ENTER	Confirms the selection of a menu item.

Table 18: Control keys function overview



Warning!

The simultaneous pressing of the two ON/OFF keys on the operator panel switches off the UPS module! You must do this on every operator panel to fully switch off the UPS.

17.6. Definition of Single/Parallel Module System (DIP Switch SW1-1)

The SW1-1 DIP switch located on the module front side can be used to set whether the associated module:

- Is a single UPS: "LOW" switch setting. An "S" (Single) is displayed in the right-hand corner of the LCD.
- Is a parallel UPS: "HIGH" switch setting. "P01" (Master), "P02" (Slave) or "P03" (Slave) is displayed in the right-hand corner of the LCD of the associated module.

17.7. Definition of Single/Multiple Enclosure System (DIP Switch SW1-9)

The DIP switch SW1-9 located on the enclosure front side can be used to set the "position" of the associated enclosure in the system:

- "First": first enclosure of the system chain
- "Middle": middle enclosure of the system chain (possibly several)
- "Last": last enclosure of the system chain

Note:

If an enclosure is a single enclosure, it is considered as “First” and “Last” of an imaginary chain. Thus, the setting of the DIP switch SW1-9 must be as follows:

SW1-9	Single enclosure	First enclosure	Middle enclosure	Last enclosure
1	ON	ON	OFF	ON
2	ON	ON	OFF	ON
3	ON	ON	OFF	ON
4	ON	ON	OFF	ON
5	ON	ON	OFF	ON
6	ON	ON	OFF	ON
7	ON	ON	OFF	ON
8	ON	ON	OFF	OFF
9	ON	OFF	OFF	ON

Table 19: DIP switch configuration

17.8. Description of the LCD Operator Panel

17.8.1. Status display

DESCRIPTION		LCD DISPLAY	
1	The load is protected by the UPS; the load is supplied by the inverter (normal operation).	LOAD PROTECTED	Unit:01/1
2	The load is not protected by the UPS and is not supplied from the mains (load on bypass).	LOAD NOT PROTECTED	Unit:01/1
3	Load supply interrupted. UPS has been switched off using the “ON/OFF” keys.	LOAD OFF SUPPLY FAILURE	Unit:01/1
4	The UPS/module no longer supplies any power. The output switch is open.	LOAD NOT SWITCHED ON PARAL. SWITCH OPEN	Unit:01/1

Table 20: Status display

**Note!**

A field with a 4-digit indicator is located on the right-hand side of the LED display, where the first two digits specify the module number, for example, Unit: 06, and the last two digits define the "Position" or rack mounting position within the enclosure, for example, 04 (Unit: 06/4). The position “4” is connected with the potential-free contact relay (Dry Port) on the communications card, for example, Alarm Module 4 (terminal blocks X1 ... X4).

DESCRIPTION		LCD DISPLAY	
1	Single system.	SYSTEM CONFIGURATION SINGLE	Unit:01/1
2	Parallel system, e.g. first enclosure / master module no. 02 in the rack-mounted unit 2.	SYSTEM CONFIGURATION PARALLEL	Unit:02/2
3	Parallel system, e.g. second enclosure / slave module no. 05 in the rack-mounted unit 3.	LOAD OFF SUPPLY FAILURE	Unit:05/3
4	Parallel system, e.g. second enclosure / slave module no. 06 in the rack-mounted unit 4.	LOAD NOT SWITCHED ON PARAL. SWITCH OPEN	Unit:06/4

Table 21: ?

The maximum number of modules is ten. The rack-mounting position can vary from 1 to 5.

The "Enclosure position" is defined in the "Service Set-Up" menu.

17.8.2. Main menu display

DESCRIPTION		LCD DISPLAY	
1	Event memory. A list of the last 64 events is stored in the PM Display.	→ ALARM MEMORY MEASUREMENTS	
2	Measured value display menu: for voltages, power, frequency, currents, autonomy, etc.	→ MEASUREMENTS FUNCTIONS	
3	The Commands menu can be used to perform: "Load on inverter", "Load on bypass", Battery test, etc.	→ FUNCTIONS UPS DATA	
4	Display of the UPS-specific and own "serial numbers".	→ UPS DATA USER INPUT	
5	The customer can make various settings: date/time, aut. battery test, etc.	→ USER INPUT SERVICE INPUT	
6	The service personnel can make various settings and customisations.	→ SERVICE INPUT MENU END	

Table 22: Main menu

17.8.3. Event memory

DESCRIPTION		LCD DISPLAY	
1	Event control, up to 64 events can be stored in the display.	01 05-10-00 LOAD ON INVERTER	14-38-59
2	This event is identified by a sequential number.	02 05-10-00 LOAD ON BYPASS	14-38-56
3	All events and alarms are specified with the date and the time of the event.	03 05-10-00 LOAD OFF	14-37-14

Table 23: Event memory

17.8.4. Measured value display

DESCRIPTION		LCD DISPLAY
1	Battery autonomy	BATT. BRIDGING (MIN) 00h 00m
2	UPS output frequency	FREQUENCY OUTPUT (HZ) 50.00
3	Bypass frequency	FREQUENCY BYPASS (HZ) 50.00
4	Battery voltage	BATTERY VOLTAGE (V) + 0.0 - 0.0
5	Battery loading current	BATTERY LOADING CURRENT (A) + 0.0 - 0.0
6	Discharge current	DISCHARGE CURRENT (A) 00.00
7	Rectifier voltage, all three phases	RECTIFIER (V) 230 230 230
8	Bypass voltage, all three phases	MAINS VOLTAGE BYPASS (V) 230 230 230
9	Output voltage, all three phases	OUTPUT VOLTAGE (V) 230 230 230
10	Output current of the three phases	OUTPUT CURRENT (A) 00.00 00.00 00.00
11	Effective power of all three phases	EFFECTIVE POWER (KW) 00.00 00.00 00.00
12	Reactive power of all three phases	REACTIVE POWER (kVar) 00.00 00.00 00.00
13	Apparent power of all three phases	APPARENT POWER (KVA) 00.00 00.00 00.00
14	Loading level of the three phases	OUTPUT POWER (%) 00.00 00.00 00.00
15	Battery capacity	BATT. CAPACITY (%) 00.00

Table 24: Measured value display overview

17.8.5. Command display

DESCRIPTION		LCD DISPLAY
1	Load switching to inverter	→ LOAD TO THE INVERTER LAST TO THE BYPASS
2	Load switching to bypass	→ LAST TO THE BYPASS PERFORM BATT. TEST
3	Battery test	→ ACTIVE BAT. TEST END

Table 25: Command display

17.8.6. UPS data

DESCRIPTION		LCD DISPLAY
1	This general UPS data is set in the factory	UPS SERIAL NUMBER NW-nnnnnn
2	Date of manufacture	PRODUCTION DATE 15-01-2003
3	EPROM version	EPROM VERSION V-000
4	Current date and time	INPUT DATE TIME dd-mm-yyyy hh:mm:ss

Table 26: UPS data

17.8.7. Customer set-up

DESCRIPTION		LCD DISPLAY
1	Language selection (not yet active)	→ LANGUAGE SELECTION INPUT DATE/TIME
		ENGLISH FRENCH POLISH
2	Setting of date and time	→ INPUT DATE/TIME INPUT BATT. TEST
		DD-MM-YY HH-MM-SS
3	Setting of the battery test	→ INPUT BATT. TEST INPUT GENERATOR
		DAY IN MONTH (1-31)
		TIME (1-24)
		RECURRING (Y/N) YES/NO
4	Setting of operation with generator group	→ INPUT GENER OP. MENU END
		BATT. LOADING LEVEL OFF YES/NO
		BYPASS OFF YES/NO

Table 27: Customer set-up

17.8.8. Service set-up

DESCRIPTION		LCD DISPLAY
1	This menu is reserved for authorised service technicians; not for customers	→ SERVICE MODE PASSWORD
2	Input of the password	→ PASSWORD

Table 28: Service set-up

**Note!**

Access to the menu requires input of the password

17.9. Operating Modes

17.9.1. "ONLINE" operating mode (inverter operation)

For the online operating mode, the consumer load is supplied by the rectifier and the inverter.

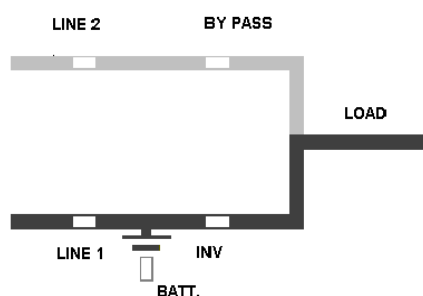


Fig. 25: Display on the device

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

Table 29: Symbol description

The operator panel (see Fig. 24: Operator panel) can be used to easily switch the UPS into the online operating mode. The online operating mode provides the largest possible protection, in particular for mains faults or failure.

This operating mode is recommended when the critical consumers (computer systems) do not allow even the smallest supply interruption.

In the improbable case of an inverter failure or an overload situation, the UPS will switch the load automatically and interruption-free to the bypass supply (switching time = 0 second).

17.9.2. "OFFLINE" operating mode (ECO or BYPASS operating mode)

For the offline operating mode, the consumer load is supplied from the mains by the static bypass.

The operator panel (see Fig. 24: Operator panel) can be used to easily switch the UPS into the bypass operating mode.

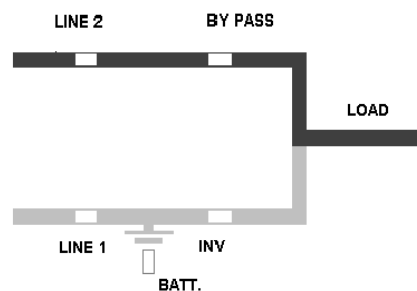


Fig. 26: Display on the device

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Green

Table 30: Symbol description

The system efficiency of the UPS is higher for the bypass operating mode. In case of a mains failure, the load will be switched automatically within five milliseconds from the mains to the inverter (this is true for both single and parallel systems). The battery charging unit remains activated in the bypass operating mode.

The bypass operating mode is recommended only when the consumers permit supply interruptions that last 3-5 milliseconds (switching time from bypass to online operating mode).

**Note!**

To ensure that the load receives the most reliable protection, the UPS must always be operated in online mode.

17.9.3. "MANUAL BYPASS" operating mode (bypass)

The manual bypass operating mode is activated using the IA1 bypass switch installed at the front:

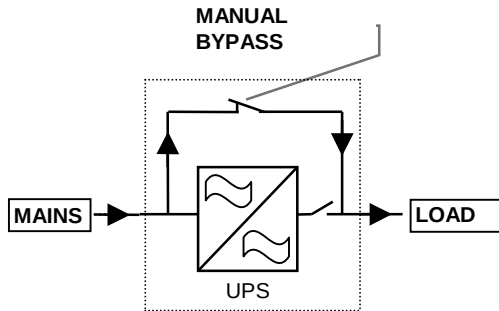


Fig. 27: BYPASS effect

SWITCH SETTING	EFFECT
ON	Bypass switch closed (load supplied directly from the mains) LCD display: "MANUAL BYP IS CLOSED" LED displays illuminate as shown in the table below.
OFF	Bypass switch open – normal operating state (load supplied by the inverter) LCD display: "MANUAL BYP IS OPEN" LED displays illuminate as shown in the table below.

Table 31: IA1 BYPASS switch

LED display	ON	OFF
LINE 1	Green	Green
LINE 2	Green	Green
BYPASS	Green	OFF
INVERTER	Red	Green
BATTERY	Green	Green

Table 32: LED display



Note!

Before you switch the load to manual bypass (IA1), always check that all UPS modules are in the "Bypass" or "ECO" operating mode.



Warning!

In manual bypass operation, the consumer load is not protected from mains failures and mains malfunctions.

17.9.4. Parallel load switch (IA2)

Each UPS enclosure (module) is equipped with an output parallel load switch (IA2). If this switch is open, the associated UPS enclosure (module) is disconnected from the parallel busbars and the load. The inverter does not supply the load when the IA2 is open.

For parallel-redundant configurations, the parallel load switch is required to disconnect a module from the parallel system without needing the load to be switched to bypass.

POSITION	EFFECT
ON	Normal operation (load supplied by the UPS)
OFF	UPS is disconnected from the parallel bus for maintenance purposes (UPS does not supply the load)

Table 33: Parallel load switch (IA2)

18. Sequence During the Commissioning

18.1. Switch-on Procedure



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.

18.1.1. UPS system status before switch-on

1. The fuses of the UPS mains supply in the input distributor have been removed.
2. Check whether the input and output wiring is attached correctly and check the phase sequence at the input.
3. Check that all parallel isolators IA2-1, IA2-2, IA2-3, IA2-4, IA2-5 (depending on the UPS enclosure type) are open (OFF position).
4. Check that the IA1 manual bypass switch is open and at the OFF position.
5. Check that all battery fuses (if present) in the UPS enclosure and those in the external battery enclosures are open or have been removed.
6. The F2 bypass fuses of all UPS modules are present.
7. Check the DIP switch SW1-9 setting. If this is a single enclosure configuration, the switch must be set as specified in *Table 19* in Section 17.7.

18.1.2. Switch-on procedure of the PMC 200

1. Insert the fuses of the mains supply of the input distributor.
 - The LINE 1 LED displays of all UPS modules illuminate green
 - The LCD signals "LOAD OFF, SUPPLY FAILURE"
2. UPS module 1: Press the "ON/OFF" key to switch on the UPS "NOT PROTECTED", the LCD display signals: „LOAD NOT

PROTECTED" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Flashes green

3. Perform "LOAD TO INVERTER" command.
The LCD display signals: "LOAD PROTECTED" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Flashes green

4. Scroll through the measurement pages.
5. Module 2: Repeat the procedure as for module 1, steps 2 – 4.
6. Module 3: Repeat the procedure as for module 1, steps 2 – 4.
7. Module 4: Repeat the procedure as for module 1, steps 2 – 4.
8. Module 5: Repeat the procedure as for module 1, steps 2 – 4.
9. Check the battery polarity and voltage.
10. For correct polarity and voltage, insert the internal fuses (if present) and the external battery fuses (or circuit-breakers).
11. Check the parallel functions:
(The circuit-breakers in the output distributor are still removed, i.e. the consumers are still not connected!) All UPS modules are in inverter mode.
12. To switch off the modules, press simultaneously both ON/OFF keys successively on all UPS operator panels (PMD). The LCD display signals: "LOAD OFF, SUPPLY FAILURE".
13. Close the IA2-1 parallel switch (ON position) for module 1. The LCD display signals: "PARALLEL SW CLOSED".

Sequence During the Commissioning

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Close the IA2-2 parallel switch (ON position) for module 2. The LCD display signals: "PARALLEL SW CLOSED".

Close the IA2-3 parallel switch (ON position) for module 3. The LCD display signals: "PARALLEL SW CLOSED".

Close the IA2-4 parallel switch (ON position) for module 4. The LCD display signals: "PARALLEL SW CLOSED".

Close the IA2-5 parallel switch (ON position) for module 5. The LCD display signals: "PARALLEL SW CLOSED".

14. To switch on the modules, press simultaneously both ON/OFF keys on all UPS operator panels (PMD). Voltage is now present at the output terminals of the UPS and all LCD displays of all operator panels signal: "LOAD PROTECTED".
15. Switch load to manual bypass.

In the Commands menu, select "LOAD TO BYPASS" and on the operator panel at one of the three UPS modules switch the load to mains. Close the IA1 manual bypass switch (ON position), the LCD display signals: "MANUAL BYP CLOSED" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green

16. Connect the load with the UPS output.
Insert the fuses in the output distributor. Check on the operator panel that the load is supplied from bypass.
17. Open the IA1 manual bypass switch. The LCD display initially signals: "MANUAL BYP OPEN", then "LOAD NOT PROTECTED".
18. Check on all LCD displays the output powers, voltages, currents and frequencies.
19. Switch the load to inverter: In the menu, select "LOAD TO INVERTER" and switch the load to inverter at one of the

present operator panels of the UPS modules.

All LCD displays now signal: "LOAD PROTECTED".

20. Recheck the output voltages and currents.



Note!

After performing the steps described above, the load is protected by the PMC 200™.

18.2. Switch-off Procedure



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.

The PMC 200 can be completely switched off when the load does not require any power for a longer time period.

The UPS can be switched to manual bypass for service or maintenance purposes or to the offline operating mode if the load does not require the highest protection.

For safety reasons, the load can be disconnected with the two ON/OFF keys on the operator panel (LOAD-OFF).

18.2.1. Complete switch-off procedure for PMC 200



Warning!

If the simultaneous operation of both ON/OFF keys is performed sequentially on all modules on the operator panel in a parallel system, the UPS output and the load can no longer be supplied during the normal operation.



Note!

The UPS can be fully switched off when the load does not require any power supply. This means the following steps can only be performed once the load has been switched off and no power supply is required.

1. Check that the load has been switched off and no power supply is required.
2. Once the load has been switched off, press simultaneously both ON/OFF keys on all UPS operator panels (PMD). The LCD signals: "LOAD OFF, SUPPLY FAILURE" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Green

3. Open all parallel switches IA2-1, IA2-2, IA2-3, IA2-4, IA2-5 (depending on the UPS enclosure type).
4. Open all internal battery fuses (if present) and the fuses or isolators in the external battery enclosures or on frames.
5. Open the UPS fuses of the low-voltage main distributor.



Danger!

Electrical shock danger!

The discharge time of the internally charged DC capacitors is at least ten minutes.



Note!

The PMC 200™ is now off and disconnected from the power supply.

18.3. Load Switching

18.3.1. Load switching: from inverter to manual bypass



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.



Note!

For service or maintenance purposes, the UPS can be switched to manual bypass.

Status of the UPS system before switching to manual bypass:

The load is protected by the PMC 200 in normal operation (the UPS module(s) run in inverter operation).

1. In the Commands menu, select "LOAD TO BYPASS" and use the ENTER key on the operator panel at one of the UPS modules to switch the load to mains. The LCD signals: "LOAD NOT PROTECTED".
2. Close the IA1 manual bypass switch (ON position). The LCD signals: "MANUAL BYP IS CLOSED" and the LED display illuminates as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	Red
BATTERY	Green

Sequence During the Commissioning

EN

3. To switch off the modules, press simultaneously both ON/OFF keys sequentially on all UPS operator panels (PMC). The LCD signals: "LOAD OFF, SUPPLY FAILURE" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashes green

4. Open the parallel switches IA2-1, IA2-2, IA2-3, IA2-4, IA2-5 (depending on the UPS enclosure type).
5. Open all internal battery fuses (if present) and the fuses or isolators in the external battery enclosures or on frames.



Danger!

Electrical shock danger!

Life-endangering voltages are still present in the UPS system.



Warning!

The load is now supplied from the mains and is no longer protected by the UPS system.

18.3.2. Load switching: from manual bypass to inverter



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.

The action describes the correct sequence to start up the UPS and to switch the load from manual bypass back to normal UPS operation (load at the inverter).

Status of the UPS system before switching to inverter operation:

The load is supplied from the mains and the UPS system is in the switched-off state (OFF).

1. Close all battery fuses, in internal and external battery enclosures or on battery frames (if present).
2. The LCD signals: "LOAD OFF, SUPPLY FAILURE" and the LED display illuminates as follows:

LED display	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashes green

3. Close the parallel switches IA2-1, IA2-2, IA2-3, IA2-4, IA2-5 (depending on the UPS enclosure type) and check the "PARALLEL SW IS CLOSED" message on all LCDs.
4. Press simultaneously both ON/OFF keys successively on all UPS operator panels (PMD). Once the UPS has started up (approx. 60 seconds), the LEDs in the operator panel illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	Red
BATTERY	Green

5. Check that all bypass LEDs illuminate green. Then open the IA1 manual bypass switch (OFF position).
6. In the Commands menu, select "LOAD TO INVERTER" and use the ENTER key on the operator panel on one of the UPS modules to switch the load to the inverter (all UPS systems will perform the command concurrently). The LCD signals: "LOAD PROTECTED".



Note!

The load is now supplied by the inverter and is protected by the UPS system.

19. Replacement of UPS Modules

19.1. Replacement of a UPS Module in Single Systems



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.

19.1.1. Removal of a UPS module from single systems



Warning heavy!

A single UPS module can weigh as much as 60 kg and so may only be carried by two persons:



The heavy UPS module can cause accidents should it fall down.



Caution:

It is prohibited that the modules are handled by just one person.



Warning!

Appropriate lifting and transport aids must be used for the removal and transport of PMC modules. Persons must NEVER carry a UPS module by themselves!



If your PMC 200 consists of just one UPS module, perform the following steps:

1. Acknowledge the alarm on a faulty module. The buzzer will be turned off. If the alarm is still present (the ALARM LED display illuminates red), this means that the UPS module is faulty.
2. If the load is supplied from the mains (BYPASS-MODE / ECO-MODE), the manual bypass (IA1) may be closed ("ON" position).



Note!

If the load is supplied by the inverter, switch the load to bypass using the "LOAD TO BYPASS" command in the COMMANDS submenu. The LCD signals: "LOAD NOT PROTECTED".

3. Close the IA1 manual bypass switch (ON position). The LCD signals: "MANUAL BYP IS CLOSED" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	Red
BATTERY	Green



Warning!

The load is now supplied from the mains and so is not protected by the UPS system.

4. Open the IA2-1 parallel switch ("OFF" position) of the faulty UPS module. The module is now disconnected from the output.
5. Press simultaneously both ON/OFF keys of the UPS module.
6. Open all internal battery fuses (if present) and the fuses or isolators in the external battery enclosures or on frames.
7. Remove the cable from the JD7 connector.
8. Loosen the four front screws used to fasten the module to the frame.

Replacement of UPS Modules

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9. Pull the module with the two black handles horizontally at the front until the connections at the back are free.



Danger!

Before you fully remove the module, wait at least ten minutes until the DC capacitors in the module have discharged.

10. Completely withdraw the module horizontally:

IMPORTANT: Two persons are required to remove the module from the UPS system. A PMC 50, 40 kW module weighs 60 kg (a PMC 10 kW module weighs 24 kg).

11. Insert a new module or close the module compartment immediately using the appropriate protective cover and the four screws.



Warning!

The load is not protected while it is supplied from the bypass / manual bypass. In case of a mains failure, the load supply will collapse and the load will fail!

19.1.2. Insertion of a UPS module in single systems

If your PMC 200 consists of just a single UPS module, perform the following steps to install the new module:

1. Remove the module compartment cover by loosening the four fastening screws.
2. Place two-thirds of the UPS module into the module compartment (check that the module is not yet inserted). Connect the operator panel cable with the JD7 plug (UPS module).
Now place the UPS module completely into the module compartment and check that the module is inserted.
3. Tighten the four front screws.
4. Check that the LINE1 and the Battery LED displays illuminate green. If yes, mains voltage is present. The LCD signals "LOAD OFF, SUPPLY FAILURE" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashes green

5. Check that the F2 bypass fuses have been inserted (module front side).
6. Close both the internal and the external battery fuses/circuit-breakers (if present).
7. Press simultaneously the two "ON/OFF" keys to start the UPS system. The LCD must signal: "LOAD DISCONNECTED PARALLEL SWITCH OPEN" and the LED display will illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

8. To test the load, switch several times to mains and to inverter (COMMANDS submenu). "LOAD TO BYPASS" command
9. Check the operating status (load to bypass, ECO-MODE) by checking the LED displays as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Green

10. Close the parallel switch (IA2).
11. Place the manual bypass switch (IA1) in the "OFF" position. The load is now supplied by the static bypass. Check the LED displays.
12. Use the "LOAD TO INVERTER" command to switch the load to inverter. The LCD signals: "LOAD PROTECTED" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green



Note!

The load is now supplied by the inverter and is protected by the UPS system.

19.2. Replacement of a UPS Module in Redundant Multi-Module Systems (Parallel Systems)



Warning heavy!

A single UPS module can weigh as much as 60 kg and so may only be carried by two persons.



The heavy UPS module can cause accidents should it fall down.



Danger!



Before you fully remove the module, wait at least ten minutes until the DC capacitors in the module have discharged.

19.2.1. Removal of a module in redundant multi-module systems

If a UPS module in a redundant parallel system is faulty, the load will continue to be protected by the functioning UPS modules in on-line mode (inverter mode) and the faulty UPS module can be replaced without switching the load to bypass!

To remove the faulty UPS module of a redundant parallel system from the frame, proceed as follows:

1. Find the faulty module and acknowledge the alarm message. The buzzer will be turned off. If the alarm is still present (the ALARM LED display illuminates red), this means that the UPS module is faulty.
2. Check that all other modules are operating in inverter mode and the LCD displays "LOAD PROTECTED". Verify the load measurement displays of the modules which are in function.
3. On the operator panel of the faulty UPS module, press simultaneously both ON/OFF keys to switch it off. The LCD display signals: "LOAD OFF, SUPPLY FAILURE" and the LED displays illuminate as follows:

Replacement of UPS Modules

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LED display	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashes green

- Open the appropriate IA2 parallel switch of the faulty UPS module ("OFF" position setting). The LCD display indicates the following: PARALLEL SW OPEN.
- Loosen the four front screws of the UPS module and pull out the UPS module approximately 0.1 m while paying attention to the JD7 cable. The above-described task causes the module to be disconnected from the voltage at the rear side of the enclosure.
- From the partially withdrawn module, remove the connection cable from the JD7 terminal.



Danger!

Before you fully remove the module, wait at least ten minutes until the DC capacitors in the module have discharged.



Warning heavy!

A single UPS module can weigh as much as 60 kg and so may only be carried by two persons:



The heavy UPS module can cause accidents should it fall down.



- Completely withdraw the module horizontally.
- Close the module compartment immediately using the appropriate protective cover and the four screws.

19.2.2. Insertion of a UPS module in redundant multi-module systems



Warning heavy!

A single UPS module can weigh as much as 60 kg and so may only be carried by two persons:



The heavy UPS module can cause accidents should it fall down.



In a redundant parallel system, a single module can be reinserted at its position without the complete system needing to be taken from normal operation. During this handling, the load remains protected by the other modules in inverter state in the system.



Note!

Before being inserted, new modules must be adapted to the system configuration. To obtain the correct parameterisation, contact your nearest service centre.

- Remove the module compartment cover by loosening the four fastening screws.
- Observe the warning concerning the weight and lift the module to the required module compartment height.
- Place two-thirds of the UPS module into the module compartment (check that the module is not yet inserted). Connect the operator panel cable with the JD7 terminal. Now push in the UPS module to the limit and check that the module is inserted. Tighten the four front screws.
- Check that the LINE1 and the Battery LED displays illuminate green. If yes, then the mains voltage is present and the LCD signals: "LOAD OFF, SUPPLY FAILURE" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashes green

5. Check that the F2 bypass fuses have been inserted (module front side).
6. Close both the internal and the external battery fuses/circuit-breakers (if present) of the new module.
7. Press simultaneously both ON/OFF keys to start the UPS module.
8. Wait 60 seconds. The LCD must signal: "LOAD DISCONNECTED PARALLEL SWITCH OPEN" and the LED display will illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Flashes green

9. To test the load, switch several times to mains and to inverter (COMMANDS submenu). "LOAD TO INVERTER" command and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green

10. Press simultaneously both ON/OFF keys to switch off the module.
11. Close the appropriate IA2 parallel switch of the replaced UPS module ("ON" switch position).

12. Press simultaneously both ON/OFF keys to start the UPS module. The module will start automatically, synchronise itself with the other modules and go online in parallel operation with the other modules. The LCD signals: "LOAD PROTECTED" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green



Note!

The load is now protected by the UPS system.

19.3. Replacement of a UPS Module in Power-Parallel Multi-Module Systems



Warning heavy!

A single UPS module can weigh as much as 60 kg and so may only be carried by two persons:



The heavy UPS module can cause accidents should it fall down.

19.3.1. Removal of a module in power-parallel multi-module systems

If a UPS module is faulty in a power-parallel system and the remaining modules cannot provide sufficient power to continue to supply the load, the load will be switched automatically to bypass (Bypass-MODE or ECO-MODE) and so supplied from the mains.

To remove the faulty UPS module of a power-parallel system from the frame, proceed as follows:

1. Find the faulty module and acknowledge the alarm message. The buzzer will be turned off. If the alarm is still present (the ALARM LED display illuminates red), this means that the UPS module is faulty.
2. Check that the load is set to bypass and all UPS modules are supplied from the mains (Bypass-MODE / ECO-MODE). In most situations, the LED displays on the

Replacement of UPS Modules

EN

operator panel of the faulty module illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	Red
BATTERY	Green

3. The LED displays on the operator panels of the functioning modules, however, illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Green

4. Close the IA1 "Maintenance Bypass Switch" (ON position).
5. The LCD signals: "MANUAL BYP IS CLOSED" and the LED display indicates the following status:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	RED
BATTERY	Green



Warning!

The load is now supplied from the mains and so is not protected by the UPS.

6. Open the appropriate IA2-1 parallel switch ("OFF" position) of the UPS module to be replaced. The module is now disconnected from the output.
7. Press simultaneously both ON/OFF keys of this UPS module.
8. Open the battery fuses/switches of the external batteries.
9. Loosen the four front screws of the UPS module and pull out the UPS module approximately 0.1 m while paying attention to the JD7 cable. This handling causes the module to be disconnected from the voltage at the rear side of the enclosure.
10. From the switched-off module, remove the cable from the JD7 terminal.



Danger!

Before you fully remove the module, wait at least ten minutes until the DC capacitors in the module have discharged.

11. Completely withdraw the module horizontally.
12. Close the module compartment immediately using the appropriate protective cover and the four screws.

19.3.2. Insertion of a module in power-parallel multi-module systems

To install a new UPS module in a power-parallel system, proceed as follows:

1. Remove the module compartment cover by loosening the four fastening screws.
2. Place two-thirds of the UPS module into the module compartment (check that the module is not yet inserted). Connect the operator panel cable with the JD7 plug (UPS module). Now push in the UPS module to the limit and check that the module is inserted.
3. Tighten the four front screws.
4. If the LINE1 and Battery LED displays illuminate green, the mains voltage is OK. The LCD signals: "LOAD OFF, SUPPLY FAILURE" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	OFF
BYPASS	OFF
INVERTER	OFF
BATTERY	Flashes green

5. Check whether the F2 bypass fuses have been inserted (module front side).
6. Close both the internal and the external battery fuses/circuit-breakers (if present) of the new module.
7. Press simultaneously the two "ON/OFF" keys to start the UPS system. The LCD must signal: "LOAD DISCONNECTED PARALLEL SWITCH OPEN" and the LED display will illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Green

8. To test the load on the inserted module, switch several times to mains and to inverter (COMMANDS submenu). "LOAD TO BYPASS" command.

9. Check the operating status (load to bypass, ECO-MODE) by checking the LED displays as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	Green
INVERTER	OFF
BATTERY	Green

10. Check that all other modules are set to bypass mode.
11. Close the parallel switch (IA2) of the new module. "PARALLEL SW IS CLOSED" appears on the LCD display.
12. Place the manual bypass switch (IA1) in the "OFF" position. The load is now supplied by the static bypass. Check the LED displays.
13. Use the "LOAD TO INVERTER" command to switch the load to inverter. The LCD signals: "LOAD PROTECTED" and the LED displays illuminate as follows:

LED display	Colour
LINE 1	Green
LINE 2	Green
BYPASS	OFF
INVERTER	Green
BATTERY	Green



Note!

The load is now protected by the UPS system.

Multiple Enclosure Systems (Parallel System Configuration)

EN

20. Multiple Enclosure Systems (Parallel System Configuration)

20.1. Concept of the Parallel-Enclosure Configuration

The PMC 200 must be switched parallel for power or redundancy. Each standard PMC 200 is equipped with the parallel supplement and so does not require any time-intensive upgrading on-site.

The parallel enclosure configuration is based on a distributed bypass architecture. This means that each UPS module is equipped with its own static bypass. A parallel system always has one master. The other modules are slaves. If the master becomes faulty, the next module (previously a slave) will assume the master function immediately and the failed master will be shutdown.

Each UPS module of a parallel configuration is equipped with its own output parallel isolator (IA2) which, when opened, disconnects the associated module from the parallel system. Once the parallel switch (IA2) of a module is opened, this module is isolated from the parallel system and so no longer provides any power at the output.

If, for example, you perform the "LOAD TO BYPASS" command on an arbitrary module, all modules will simultaneously switch the load to the mains. When you perform the "LOAD TO INVERTER" command on an arbitrary module, all modules will simultaneously switch the load to the inverter.

To provide redundancy (maximum availability) or to increase the power, the PMC 200 can be switched parallel.



Note!

To ensure that the load receives the maximum protection, we recommend that it always is supplied by the inverter (online operating mode).



Note!

The BYPASS MODE (ECO-MODE) operating mode of a parallel system is the same as for a PMC 200 single system. When in a UPS parallel enclosure system the load is switched to bypass (load on mains) and the mains fails, all UPS systems will automatically switch the load to inverter within 5 msec.

20.2. Installation Instructions

20.2.1. Introduction



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.



Note!

To achieve a uniform load distribution between the UPS enclosures, the input cables from the input distributor to the UPS, and the output cable from the UPS to the output distributor should have the same length.

Ensure that for the wiring of the parallel enclosures all cables must be led to the same connection terminal of the associated enclosure and observe the details of the same phase sequence, for example: Phase1 for UPS 1 = Phase1 for UPS 2 = ... = Phase1 for UPS n.

20.3. Parallel Connection of UPS Enclosures

20.3.1. Connection of the parallel communications cable (bus lines)

To ensure that various parallel functions and operating states function correctly, the parallel units must be able to continuously communicate with each other. This is permitted through the use of the so-called communications bus cable connections.

Once the input and output wiring of each UPS has been made, the units must be connected with each other to produce a parallel system. For this purpose, a communications bus is used to connect the units with each other. Create the bus connections as described in *Fig. 28* on Page 70.



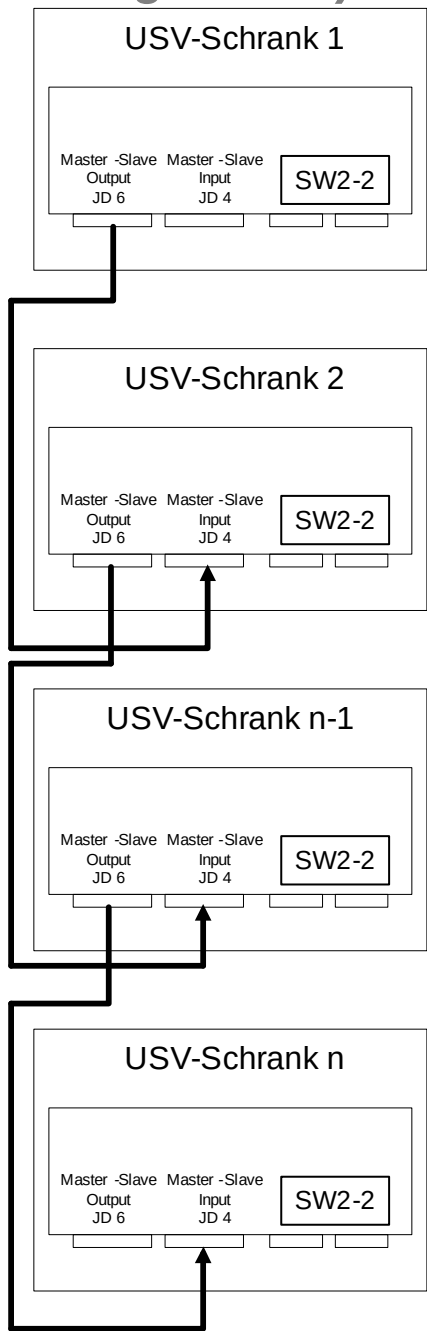
Warning!

The bus cables may only be connected when the UPS has been switched off and the IA2 parallel switches are open. Observe the connection order.

1. Connect the parallel adaptor to the JD8 port (UPD distributor).
2. Set the SW2-2 DIP switch on each parallel adaptor in function of the position of the associated enclosure in the parallel chain (see Section 20.3.1.1).
3. Connect port JD6 on the parallel adaptor for UPS enclosure 1 with port JD5 on the parallel adaptor for UPS enclosure 2 with the appropriate bus cable.
4. Port JD6 on the parallel adaptor for UPS enclosure 2 with port JD5 on the parallel adaptor for UPS enclosure 3 with the appropriate bus cable.
5. Connect the remaining UPS enclosures in the same manner.

Multiple Enclosure Systems (Parallel System Configuration)

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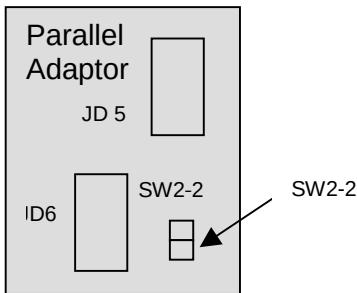
20.3.1.1. Parallel adaptor and SW2-2 DIP switch

For the parallel connection of UPS enclosures, the parallel adaptor is connected to port JD8 (UPS distributor). The JD5 and JD6 ports are then connected as described in Section 20.3.1.



Note!

Set correctly the SW2-2 switch on each UPS system and depending on its position in the parallel system as shown in the following table.



	Single enclosure	First enclosure	Middle enclosure	Last enclosure
SW 1	ON	OFF	OFF	ON
SW 2	ON	ON	OFF	OFF

Table 34: SW2-2 configuration

Fig. 28: Bus cable connections of the enclosures in the parallel enclosure system with parallel adaptor

Multiple Enclosure Systems (Parallel System Configuration)

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20.3.2. SW1-9 DIP switch settings on the communications card



Warning!

Prior to commissioning the parallel system, the SW1-9 DIP switches must first be set correctly.

20.3.3. SW1-9 DIP switch

The SW1-9 DIP switch is located on each enclosure (PMC 200). This switch can be used to specify the “position of the PMC 200 enclosure” in a parallel chain. Define each PMC 200 enclosure in a parallel chain as follows:

1. Set the “First”
2. “Middle” (can be several), or
3. “Last”

enclosure in the parallel chain with the appropriate setting for SW 1-9 DIP switch on each enclosure as specified in the following table:

SW1-9	Single enclosure	First enclosure	Middle enclosure	Last enclosure
1	ON	ON	OFF	ON
2	ON	ON	OFF	ON
3	ON	ON	OFF	ON
4	ON	ON	OFF	ON
5	ON	ON	OFF	ON
6	ON	ON	OFF	ON
7	ON	ON	OFF	ON
8	ON	ON	OFF	OFF
9	ON	OFF	OFF	ON

Table 35: Configuration of SW 1-9



Warning!

Once the correct setting of the SW1-9 has been made on all PMC 200 enclosures, the UPS system can be commissioned.

20.3.4. ON/OFF keys

The ON/OFF keys are used to shutdown the UPS system for service or maintenance purposes or in an emergency situation.



Warning!

The concurrent operation of both ON/OFF keys on the operating panel of each module in a parallel system will deactivate the UPS output and no longer supply the load!

20.3.5. Parallel load isolator (IA2)

Each UPS module is equipped with an IA2 parallel switch. The parallel switch is an important part of the UPS module that permits the separation of the parallel system without switching the load to bypass.



Note!

IA2 open:

The associated UPS module is disconnected from the output. There is no communication between the disconnected unit and the parallel system. The disconnected module can be replaced without affecting the remaining system.

IA2 closed:

The associated UPS module will be switched to the parallel system. Important note: before you close the IA2 of a UPS module, ensure that the operating mode of each module corresponds to the operating mode of the modules with closed IA2. E.g. when all UPS systems with connected IA2 are set to inverter, check that the unit to be added is also set to inverter.

Multiple Enclosure Systems (Parallel System Configuration)

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20.3.6. Bypass / manual bypass (IA1)

Two types of parallel system configurations exist: redundant-parallel and power-parallel systems (see Chapters 18 and 19).

20.3.7. Redundant parallel configuration

In a redundant parallel system, a UPS module can be easily disconnected from the system by opening the appropriate switch (IA2). This module can then be tested or switched off without affecting the rest of the parallel system. The remaining system will continue to protect the load. The disconnected module can be replaced without switching the load to the mains (IA1 bypass / manual bypass).

20.3.8. Power-parallel configuration

If one of the UPS modules for a power-parallel system fails, the load will be automatically switched with the static bypass to the mains. To replace the faulty module, the load must be switched with the manual bypass (IA1) to the mains.

20.3.9. ECO-MODE (offline/bypass operating state) for parallel systems

The ECO-MODE operating mode in a parallel system is the same as for single systems. If in a PMC 200 parallel system the load is supplied from the mains (load to mains) and a power failure occurs, all UPS systems will automatically switch the load back to the inverter within 5 msec.



Note!

To ensure that the load receives the most reliable protection, the UPS should always be operated in UPS mode.

Multiple Enclosure Systems (Parallel System Configuration)

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20.4. Commissioning of Multi-Enclosure Parallel Systems



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.

20.4.1. Switch-on of a multi-enclosure parallel system

Before you switch on a multi-enclosure parallel system, check that:

1. The input and the output wiring has been carried out correctly in accordance with Chapter 12 of this manual.
2. The communications bus cable has been connected correctly in accordance with Chapter 20.3.1 of this manual.
3. The DIP switches for the PMC 200™ enclosure have been set correctly in accordance with Section 20.3.2 of this manual.
4. All internal (if present) and/or external battery enclosures or frames have been cabled and connected correctly.
5. The commissioning of a parallel enclosure system is performed similar to the commissioning procedures of a single PMC 200 enclosure (see Section 18.1).

20.4.2. Switch-off of a multi-enclosure parallel system

Before you switch-off a multi-enclosure parallel system, ensure that the consumers do not require any power and they have been switched off.



Warning!

The UPS system can be switched off completely provided the load does not need to be provided with power. Consequently, the following steps described in this section are performed only after the loads have been switched off and they no longer need to be supplied with power.

To completely switch off a parallel system, perform the same switch-off procedures as described in Section 18.2.

20.4.3. Replacement of a UPS module in a multi-enclosure parallel system

If a UPS module fails in a parallel system, the replacement of the module is performed like the replacement procedures described in Chapter 19 of this manual.

21. Maintenance

21.1. Introduction



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.

To ensure not only the non-failing operation of the PMC 200, but also continuing and effective protection of the connected consumers, we recommend that the batteries are tested every six months, although this depends on the ambient temperature.

21.2. Responsibility of the Operating Company

The UPS does not contain any parts that can be serviced by the customer. This reduces the operating company's maintenance tasks to a minimum. To optimise the service life and reliability of the UPS system and the batteries, the operating environment of the UPS should be kept not only cool and dry, but also free from dust and vibration. The batteries should always be maintained in the fully-charged state.

21.3. Routine Maintenance

Regular preventative maintenance must be performed on the UPS system. These maintenance tasks are necessary to ensure a maximum service life and high reliability of the UPS system. During the commissioning of the UPS, the service engineer will attach a service booklet to the UPS so that the complete service life of the UPS system can be documented.

Preventative maintenance tasks include work on the UPS where dangerous AC and DC voltages are present. These maintenance tasks may only be performed by service personnel trained or authorised by Rittal and by authorised service engineers, because only such persons are fully aware of all dangers within the UPS.

The service engineer performs the following inspections for a preventative maintenance task:

- Room and environmental situation
- Status of the electrical installation
- Cooling air quantity
- Operation and setting of the rectifier
- Operation and setting of the inverter
- Operation of the static switch
- Battery state
- Consumer load data
- State of the alarm and monitoring equipment
- Operation of all installed options

21.4. Battery Test

The battery test takes approximately three minutes and should be performed only when:

- No alarm situation is present
- The battery is fully-charged

The battery test can be performed independent of the operating mode (OFFLINE or ONLINE) and with or without connected load.

The battery test is started from the operator panel (see Section 17.8.5).

22. Troubleshooting



Warning!

The work on the UPS system described in this section may only be performed by service technicians of the manufacturer or its contract partner.

22.1. Alarms

When an alarm situation occurs, the red "Alarm" LED display illuminates and the acoustic alarm sounds. In such a case, proceed as follows:

1. Acknowledge the buzzer by pressing the "Reset" key.
2. Determine the cause of the alarm situation using the EVENT LOG in the MAIN menu.
3. In case of doubt, contact your nearest service centre.
4. Information about the fault identification and correction is contained in the next section.

22.2. Menu, Commands, Event Memory, Measured Values

Chapter 17 contains a detailed description of the menus, commands, event memory and measurements that can be performed and displayed on the LCD.

22.3. Fault Cause and Correction

The most important alarm situations that can occur:

Alarm situation	Meaning	Possible solution
UPS FAULT	The UPS has a fault and so normal operation cannot be guaranteed.	Call the authorised service centre to get support.
MAINS BYP/RECT FAULT	The mains voltage lies outside the specified tolerances.	The UPS input voltage is too low or absent. If the mains voltage at the site appears to be correct, check the input fuses and switches.
OUTPUT SHORT	A short-circuit is present at the consumer side of the UPS output.	Check all output connections and make any necessary repairs.
OVERLOAD	The load exceeds the UPS rated power.	Identify which device is causing the overload and disconnect it from the UPS. Do not connect any laser printer, copier, fan heater, electric kettle, etc., to the UPS.
OVERTEMPERATURE	The UPS temperature exceeds the permitted value.	Check that the ambient temperature of the UPS lies below 30°C. If the ambient temperature is correct, call the authorised service centre for support.
BATTERY CHARGER OFF	The connected battery and the charging setting do not match; battery charger failure.	Call the authorised service centre to get support.
INVERTER FAULT	Inverter failure.	Call the authorised service centre to get support.
SYNCHRON FAULT	The inverter and the mains are not synchronous.	The UPS input frequency lies outside the operational data or the static bypass has been blocked temporarily.
BATTERY IN DISCHARGE	Pending end of the battery autonomy.	Switch off the connected load before the UPS switches itself off to protect the batteries.
MANUAL BYP IS CLOSED	Manual bypass closed. The load is supplied from the mains.	This alarm will be displayed only when the manual bypass is activated.

23. Options

The **PMC 200™** is equipped for the following supplementary devices:

- Remote shutdown facilities
- GENERATOR ON circuit
- Two customer inputs (on request)
- Temperature sensor for controlling the temperature-dependent battery charging
- Software for the automatic shutdown and monitoring
- SNMP interface for the network management and remote monitoring
- Modem/Ethernet interface for management software

23.1. Remote Shutdown

The remote shutdown facilities at the X1 ... X4 terminal blocks; terminal X1/1 ... X1/2 located at the lower right-hand part of the **PMC 200™** on the communications card, **functions only** with a normally closed contact that activates when the remote shutdown switching sequence opens. See Section 16.2.1 for detailed notes.



Note!

To allow the removal, maintenance or testing of an external remote shutdown facility to be performed without disrupting the normal operation of the UPS, we recommend that a terminal block with short-circuit terminals is provided between the UPS and the remote shutdown facility.

1. Use a 2-pole shielded cable (cable cross-section $2 \times 0.5 \text{ mm}^2$) with a maximum length of 100 m.
2. Connect the cable as shown in Fig. 29.

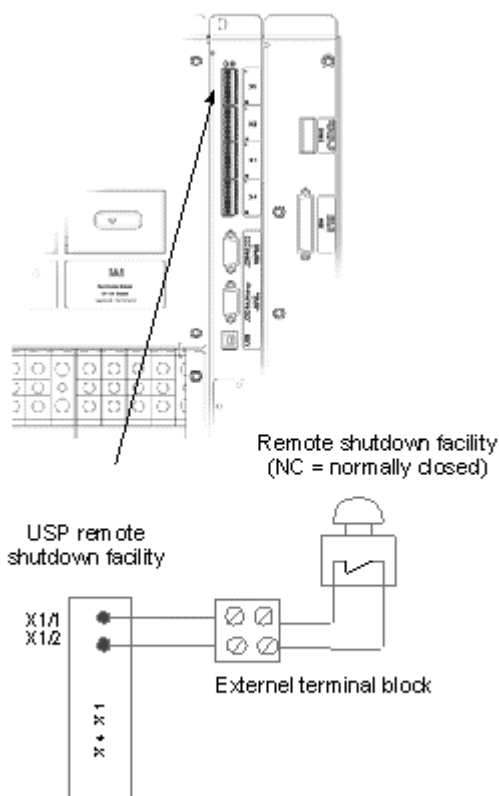


Fig. 29: Wiring of a remote shutdown facility

23.2. Generator ON Function

The Generator ON (GEN ON) circuit (terminal X1/3 ... X1/4) located on the terminal blocks X1 ... X4 which in turn are located at the lower left-hand part of the **PMC 200™** on the communications card, **functions only** with a normally open contact that signals on closing to the internal logic that the generator now supplies the UPS system with power. See Section 16.2.1 for detailed notes.



Note!

When this function is used, the static bypass will be blocked so that the UPS cannot switch the load to generator supply.

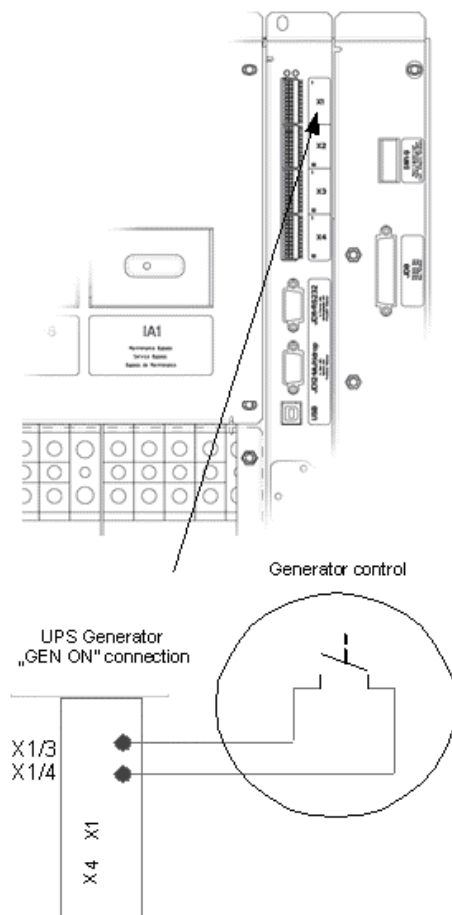


Fig. 30: Connection of the Generator ON signal

23.3. Rittal UPS Management Shutdown and Management Software

23.3.1. Why is UPS management important?

The combination of a UPS with network management instruments, such as those provided by the SNMP protocol, allows system administrators to save their data and protect their system from faults or data loss. This protection is also provided in case of an extended power failure or when the battery is reaching the end of its capacity. In case of a mains supply failure, system administrators can also monitor their network from a central location and so determine bottlenecks early. Indeed, the mains supply is intermittently unreliable. It can be a difficult task to provide all network facilities with a continuous power supply. The situation becomes even more complicated when worldwide systems are managed using Local Area Network (LAN) or Wide Area Network (WAN).

Measures can be adopted in case of a mains failure to protect the system and valuable data. If the operator does not act, severe damage can occur. The UPS software will respond automatically in such a case and shutdown the system. Rittal considers it important to have a complete solution for its UPS and offer its customers a number of remote monitoring instruments to provide an optimum protection.

23.3.2. Rittal UPS Management shutdown and monitoring software

The Rittal UPS Management software is an external monitoring and shutdown software that functions with all Rittal UPS products. Both with the DRY PORT (relay) on the terminal blocks X2 ... X4 and also using the RS232 JD11 interface on the communications card.

The software package consists of a CD-ROM that covers the most popular operating systems (Windows, Unix, OS/2, DEC VMS, Novell, Apple), a standard interface connection and an operating manual.

The Dry Ports X2 ... X4 with potential-free contacts can also be used together with the RITTAL UPS MANAGEMENT software for the automatic shutdown. For wiring the terminal blocks X2 ... X4, a cable with 0.5 mm²

conductor cross-section both to the UPS and also to the serial interface of the server is required.

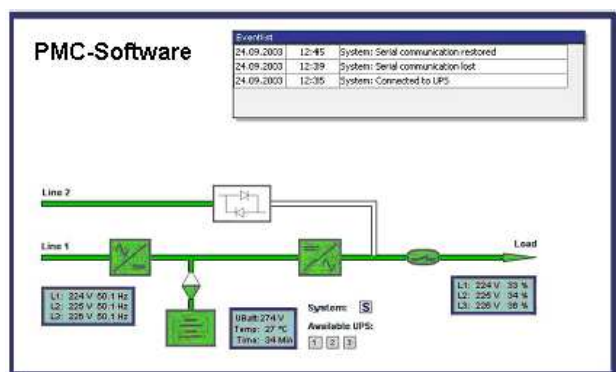


Fig. 31: Monitoring diagram

The main properties of the RITTAL UPS MANAGEMENT software are:

- Automatic unattended master/slave shutdown in heterogeneous networks
- Screen display of the residual autonomy / battery time
- Screen display of the server logoff and shutdown procedures
- Event memory with date and time, storage of all UPS activities and mains data
- Programming of UPS operating modes, such as ECO-MODE, Service-MODE, etc.
- Graphical user interface for Windows-compatible platforms
- Special software modules for the automatic saving/closing of open MS-Office documents
- Compatible with all supplementary modules, such as UPSDIALER, SNMP adaptor, temperature sensors, etc.

The UPS management software is a client/server application for networks and local workstations. In general, the Rittal UPS Management software consists of two parts: the server module of the UPS management software is UPSServ that communicates with the UPS using the RS232 interface. As background application, UPSServ collects the messages from the UPS. UPSServ interprets the received messages and

makes them available to the UPSCli client module and each SNMP-based control system.

If UPSServ detects voltage changes or a mains failure, it can perform various so-called "system event routines" that can be used, for example, to shutdown the server or send a warning to the connected users. These "system event routines" are part of the UPS Management software and can be customised if necessary.

A licence is assigned with each software serial number in order to use the so-called UPS service on a server in conjunction with a UPS and an unlimited number of connected WINDOWS workstations. An additional licence is required for each new server for the operation with two or more servers. It does not matter whether the UPS service on these servers is active or the server has been stopped by a remote UPS service. The same is true for the use of RCCMD with the "remote send/receive" modules for the "multiserver shutdown" under NT, UNIX and other operating systems. The service programs are normally delivered as single licence. To use a single CD-ROM for several "Multiserver Shutdown" systems, you must purchase additional licence code.

Parallel and redundant UPS systems can also be managed by the software. The main principle can be rephrased as: a server should be shutdown only when this is actually necessary. Consequently, a parallel system must always be considered as a whole and taking account of the redundancy. The following statements are true:

- Each alarm from any UPS units will be signalled without delay, although...
- a measure for a severe fault will be made only when the minimum required number of UPS units necessary to supply the load indicates an alarm
- The real residual autonomy time of the complete parallel system will be calculated
- A single system (module) can be subject to a service task without affecting the system monitoring

The data for Rittal UPS systems can be integrated in a network in two ways:

1. By the server supplied by the UPS itself and integrated in the network. In most cases, this server is used as sub-agent and you require only the Rittal UPS Management software without an SNMP adaptor. In this case you require a standard connection between the RS232 JD11 interface of the UPS and the RS232 interface of the computer/server.
2. In some cases it is better to use a so-called SNMP adaptor to integrate the UPS in the network. This allows up to 50 computers to be shutdown in an RCCMD environment. RCCMD (Remote Console Command) is an additional software module used to execute a command (typically a shutdown command) on a remote system.

23.4. SNMP Card/Adaptor for Network Management / Remote Monitoring

The Simple Network Management Protocol (SNMP) is a worldwide-standardised communications protocol. It is used to monitor every device in the network using a simple control language. The Rittal UPS Management software also makes available the data in this SNMP format using an internal software package. The operating system that you use must support SNMP. We offer our Rittal UPS Management software with SNMP functionality for Novell, OS/2, all Windows that run on INTEL and ALPHA, DEC VMS, Apple computers.

Two types of SNMP interfaces with identical function are available: an external SNMP adaptor (box) and an internal SNMP card. Both can manage the parallel system (N Module) and output either general values that are uniform for the complete parallel system or specific values for individual modules.

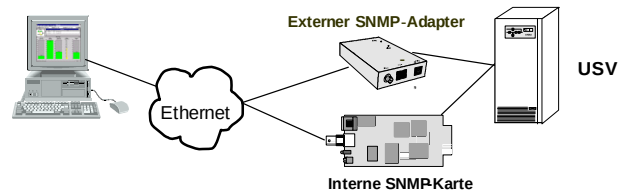


Fig. 32: SNMP adaptor

The SNMP adaptor can be configured using Telnet, http (Web browser) or a serial connection. At least a network connection (Ethernet) is necessary for the normal operation.

The SNMP adaptor can use the "RCCMD Send" function to send status messages to connected users or initiate an automatic shutdown in the complete network. The shutdown procedure can be initiated by a short battery autonomy time and a time counter; an alarm signal will also be issued. This also allows the shutdown procedure to begin without human intervention and is completely software controlled.

The narrow (125x70 mm) external SNMP adaptor is delivered with the following interfaces:



Fig. 33: External SNMP adaptor



Fig. 34: Internal SNMP adaptor

1. RJ-45 socket for 10/100 Base-T network connection (automatic switching)
2. Interface for the serial configuration (COM2) or the optional RS485 ModBus protocol
3. Fault/connection LED for the UPS connection

4. Aux port
5. DIP switch
6. Serial interface for the UPS (COM1), D9 plug
7. Voltage supply (9 VDC or 9-36 VDC, depending on the model)

The internal SNMP plug-in card can be inserted in an appropriate slot of the UPS. This adaptor communicates with the UPS using the serial interface and permits a shutdown of several servers without requiring additional SNMP management software.

For additional detailed information, refer to the software manual supplied with the Power Modular Concept (PMC) software.

RCCMD – Remote Console Command Modules for "multi-server shutdown". These independent software modules are provided for the sending and the receiving of "remote commands". RCCMD makes it possible to perform a global shutdown in a "heterogeneous multiplatform" network. Similar to the PMC software, the new RCCMD2 version is available for the most popular operating systems. Our SNMP adaptors are RCCMD-compatible.

24. PMC 200 System Description

In those areas that do not tolerate any downtimes, it is important to ensure the continuous availability of the power supply. To counter the continuous requirements for dynamic IT- and process-oriented areas, robust and easily adaptable supply protection concepts are necessary, because they are subject to continuous changes as the result of server technologies, migration and centralisation.

PMC 200 forms the basis for a continuous availability of the supply technology for network-dependent infrastructures of the company computer centres in which not only the continuity of the business activities is very important but also in process-controlled environments where the continuity of the production is critical.

The Rittal PMC 200 is the second generation of a leading Double Conversion power supply technology (UPS) of the highest power density (HPD) which, based on modular rack-mounted technology, permits a fast distribution that improves the adaptability and increases the system availability while reducing the total cost of operation (TCO).

PMC 200s is a unique "on-demand" architecture that connects the power modules, the power distribution unit, the battery enclosures as back-up and the monitoring and management solutions to permit a simple selection of optimised configurations.

The PMC 200 (Power Modular Concept) provides users in IT environments with the highest availability and unlimited flexibility while offering the lowest operating costs.

These technical specifications contain detailed technical information about mechanical, electrical and environment-related performance data of the PMC 200 that provide help for questions concerning the tender solutions and for end user requirements.

The PMC 200 is a modular plug-in concept. To cover a wide range of power supply requirements, the system offers four different UPS enclosure types with seven types of HPD modules.

The three MD UPS enclosure types: PMC Plus-60, PMC Extend 100 can accept the four MD-

HPD modules 8 or 12 or 15 or 20 with: 10 kVA / 8 kW – 15 kVA / 12 kW – 20 kVA / 16 kW – 25 kVA / 20 kW power.

The three MX UPS enclosure types: PMC Plus-120, PMC Extend 200 can accept the three types of MX-HPD modules 24 or 32 or 40 with: 30 kVA/24 kW – 40 kVA/32 kW – 45 kVA/40 kW power.

Main characteristics of the PMC 200:

- Maximum availability, modular, Power Module Concept (PMC)
 - ⇒ Almost no failure times
- High power density (up to 342 kW/m²)
 - ⇒ Saving of cost-intensive space thanks to its small footprint
- Unit output power factor (kW=kVA), full power for all consumers
 - ⇒ No power reduction for loads with Unity PF = 1
- Blade server-friendly power supply with full power from PF 0.9 capacitive to 0.8 inductive
 - ⇒ No power reduction for capacitive loads
- Maximum efficiency, also in the partial load range, efficiency = 91 - 95.5% for load 25 - 100% (depending on the module power and loading type)
 - ⇒ Energy cost savings during the UPS life cycle
- Very low distortions in the THDi input current, THDi = < 2 - 3% for output loads 100 – 40%
 - ⇒ Cost saving during the installation and for the generator

25. Technical Properties

25.1. Mechanical Properties of the MD Enclosures and Modules of Medium Power Density

PMC 200		PMC Plus-60	PMC Extend-100
Configuration:	Max.	3 modules (10-25 kVA) and up to 180x 7/9 Ah batteries	5 modules (10-25 kVA) and no batteries
Max. connection power	kVA	75	125
Dimensions (WxHxD)	mm	600x2000x1000	600x2000x1000
Weight of the empty enclosure without modules and without batteries	kg	220	160
Weight of the enclosure with modules, without batteries	kg	292 to 319 (with three modules)	280 to 325 (with five modules)
Colours:		Front: RAL 7035 Side panels: RAL 7035	

Table 36: System overview

		MPD 8	MPD 12	MPD 16	MPD 20
Output rated power	kVA	10	15	20	25
Output effective power	kW	8	12	16	20
Output power for power factor $\cos\phi = 1$	kVA / kW	8/8	12/12	16/16	20/20
Variable number of 12 V blocks:		30–50	30–50	30–50	40–50
Dimensions (WxHxD)	mm	483x225x700			
Weight of the UPS module	kg	24			33
Colour		Front: RAL 7035			

Table 37: Module overview

25.2. Mechanical Properties of the MX Enclosures and Modules of High Power Density

CONCEPTPOWER DPA		PMC Plus-120	PMC Extend-200
Configuration:	Max.	3 modules (30-45 kVA) and up to 240x 7/9 Ah batteries	5 modules (30-45 kVA) and no batteries
Max. connection power	kVA	150	250
Dimensions (WxHxD)	mm	800x2000x1000	800x2000x1000
Weight of the empty enclosure without modules and without batteries	kg	270	190
Weight of the enclosure with modules and without batteries	kg	420 to 450 (with three modules)	440 to 490 (with five modules)
Colours		Front: RAL 7035 Side panels: RAL 7035	

Table 38: System overview

		HPD 24	HPD 32	HPD 40
Output rated power	kVA	30	40	45 ¹⁾
Output effective power	kW	24	32	40
Output power for power factor cosphi=1	kVA / kW	24 / 24	32 / 32	40 /40
Possible number of 12 V blocks:		40-50	40-50	40-50
Dimensions (WxHxD)	mm	663x225x720		
Weight of the UPS module	kg	50	57	60
Colour		Front: RAL 7035		
1) In inverter operating mode 50 KVA / 40 kW / bypass operating mode 45 KVA / 40 kW				

Table 39: Module overview

25.3. Power Selection Table for PMC 200 Modules

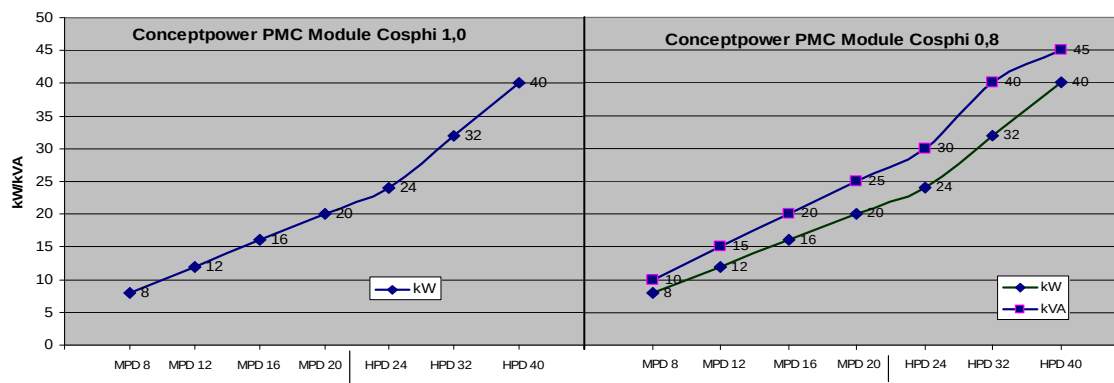


Table 40: PMC 200: Power modules MPD8 – HPD40

26. Technical Specifications: Input

Module selection		MPD				HPD		
Module types		MPD 8	MPD 12	MPD 16	MPD 20	HPD 24	HPD 32	HPD 40
Output rated power per module	kVA	10	15	20	25	30	40	45 ¹⁾
Output rated power per module	KW	8	12	16	20	24	32	40
Nominal input voltage	V	3x 380/220 V+N, 3x 400/230 V+N, 3x 415/240 V+N						
Input voltage tolerance (based on 3x 400/230 V) for output load in %:	V	(-23%/+15%) 3x 308/177 V to 3x 460/264 V at < 100% load (-30%/+15%) 3x 280/161 V to 3x 460/264 V at < 80% load (-40%/+15%) 3x 240/138 V to 3x 460/264 V at < 60% load						
Input frequency	Hz	35–70						
Input power factor		PF=0.99 at 100% load						
Switch-on current	A	Limited by softstart / max. rated current						
Input current harmonic distortion factor THDi		Sinusoidal current, THDi = <2% at 100% load						
Max. input power per module at output rated loading and charged battery (output factor $\cos\phi = 1.0$)	kW	8.5	12.8	17.0	21.3	25.4	33.9	42.9
Max. input current per module at output rated loading and charged battery (output factor $\cos\phi = 1.0$)	A	12.3	18.5	24.7	30.8	36.8	49.1	62.1
Max. input power per module at output rated loading and discharged battery (output factor $\cos\phi = 1.0$)	kW	9.3	14.0	18.6	23.3	27.8	37.1	46.9
Max. input current per module at output rated loading and discharged battery (output factor $\cos\phi = 1.0$)	A	13.5	20.2	27.0	33.7	40.3	53.7	68.0
1) In inverter operating mode 50 KVA / 40 kW / bypass operating mode 45 KVA / 40 kW								

Table 41: Input technical specifications

26.1. Diagram: Load-Dependent Input Power Factor

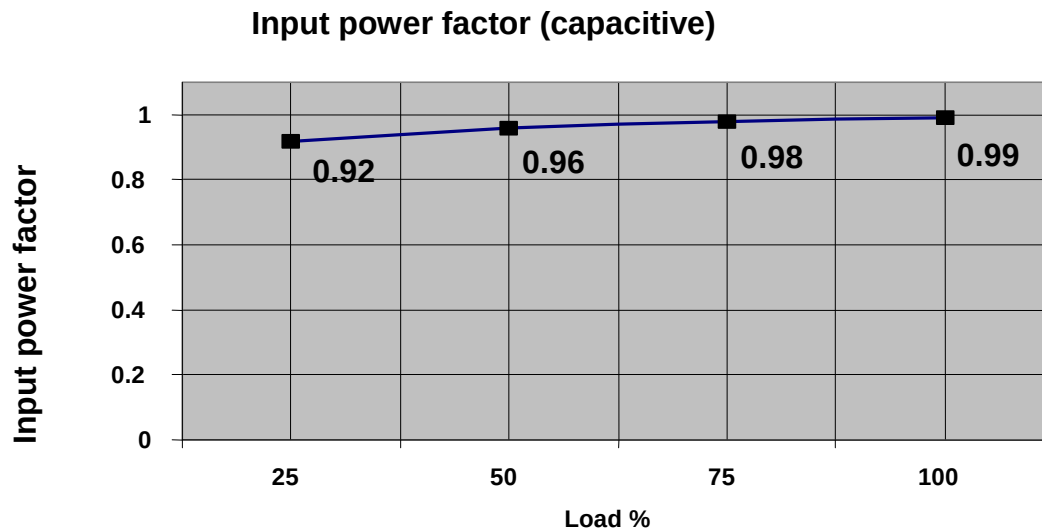


Table 42: Input power factor (capacitive)

26.2. Diagram: Load-Dependent Input Current Distortion THDi

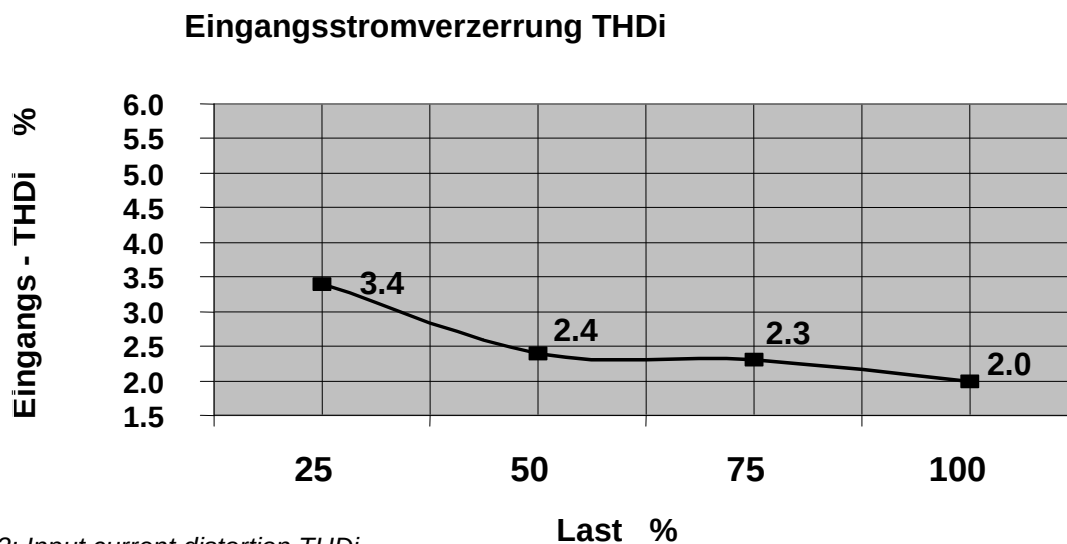


Table 43: Input current distortion THDi

27. Technical Specifications: Battery

Module selection		MPD				HPD		
Module types		MPD 8	MPD 12	MPD 16	MPD 20	HPD 24	HPD 32	HPD 40
Variable number of 12 V blocks	Number:	30-50	30-50	30-50	40-50	40-50	40-50	40-50
Maximum battery loading current	A	6A Standard (10A optional)				10 A Standard (15 A optional)		
Battery loading current curve		Without ripple current; IU curve (DIN 41773)						
Temperature compensation of the loading current		Standard (temperature sensor optional)						
Battery test		Automatic and periodic (can be set)						
Battery types		Maintenance-free VRLA lead batteries or NiCd batteries						

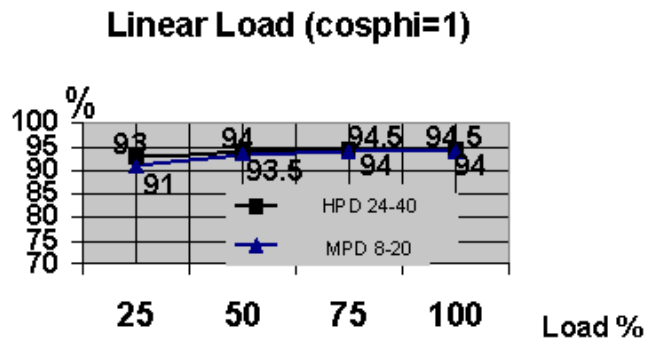
Table 44: Battery technical specifications

28. Technical Specifications: Output

Module selection		MPD				HPD		
Module types		MPD 8	MPD 13	MPD 16	MPD 20	HPD 24	HPD 32	HPD 40
Output rated power per module	kVA	10	15	20	25	30	40	45 ¹⁾
Output rated power per module	kW	8	12	16	20	24	32	40
Output rated current In for cosphi 1.0 and 3x 400 V	A	11.6	17.4	23.2	29	35	46.5	58
Output rated voltages	V	3x 380/220 V or 3x 400/230 V or 3x 415/240 V						
Output voltage stability	%	Static: < +/- 1% Dynamic (load change 0%-100% or 100%-0%): < +/-4%						
Output current harmonic distortion factor	%	With linear load: < +/-2% with non-linear load (EN62040-3:2001): < +/-4%						
Output frequency	Hz	50 Hz or 60 Hz						
Output frequency tolerance	%	Mains-synchronous: < +/-2% (can be set for bypass operation) Or < +/-4% Free-running: +/-0.1%						
Bypass operating range		For rated input voltage 3x 400 V: +/- 15% or absolute 190 V to 264 V phase-N						
Possible load asymmetry (all three phases are regulated independently)	%	100%						
Phase angle deviation (with 100% asymmetric load)	Degree	+/- 0 degrees						
Inverter overload capability	%	125% load: 10 min. 150% load: 60 sec.						
Output short-circuit current (RMS)	A	Inverter: 2 x I _n during 250 ms Bypass: 10 x I _n during 10 ms						
Crest factor		3:1						
1) In inverter operating mode 50 KVA / 40 kW / bypass operating mode 45 KVA / 40 kW								

Table 45: Output technical specifications

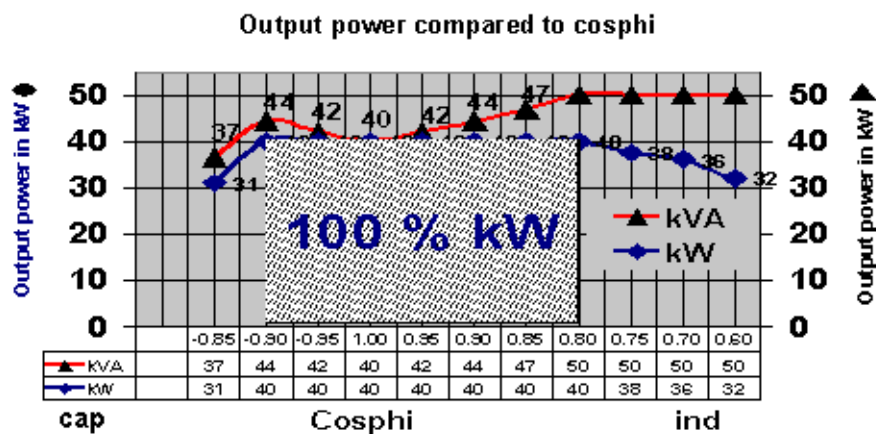
28.1. Diagram: AC-AC Efficiency with Linear Load for cosphi 1



The efficiency is up to 1% higher for an output load with cosphi=0.8. Detailed description, see Chapter 29 Environmental Conditions.

Table 46: Efficiency

28.2. Diagram: Output Power in kW and kVA Depending on cosphi



Technical Specifications: Output

EN

	cosφ	MPD module selection								HPD module selection					
		MPD 8		MPD 12		MPD 16		MPD 20		HPD 24		HPD 32		HPD 40 ¹⁾	
		kW	kVA	kW	kVA	kW	kVA	kW	kVA	kW	kVA	kW	kVA	kW	kVA
Cap.	0.85	6.2	7.3	9.3	11	12.3	14.5	15.4	18.1	18.5	21.8	24.6	29	31	36.5
	0.90	8	8.9	12	13.3	16	17.8	20	22.2	24	26.7	32	35.6	40	44.4
	0.95	8	8.4	12	12.6	16	16.8	20	21.1	24	25.3	32	33.7	40	42.1
	1.00	8	8	12	12	16	16	20	20.0	24	24	32	32.0	40	40
Ind.	0.95	8	8.4	12	12.6	16	16.8	20	21.1	24	25.3	32	33.7	40	42.1
	0.90	8	8.9	12	13.3	16	17.8	20	22.2	24	26.7	32	35.6	40	44.4
	0.85	8	9.4	12	14.1	16	18.8	20	23.5	24	28.2	32	37.6	40	47.1
	0.80	8	10	12	15	16	20	20	25	24	30	32	40	40	50 ¹⁾
	0.75	7.6	10	11.4	15	15.3	20	19.1	25	22.9	30	30.5	40	38	50 ¹⁾
	0.70	7.2	10	10.8	15	14.5	20	18.1	25	21.7	30	28.9	40	36	50 ¹⁾
	0.60	6.3	10	9.5	15	12.7	20	15.9	25	19	30	25.4	40	32	50 ¹⁾

1) In inverter operating mode 50 KVA / 40 kW / bypass operating mode 45 KVA / 40 kW

Table 47: Power overview

We reserve the right to make changes to this table!

29. Technical Specifications: Environmental Conditions

Module selection		MPD				HPD		
Module types		8	12	16	20	24	32	40
Noise level at 100% / 50% load per module	dB A	55/4 9	57/4 9	57/4 9	57/4 9	59/5 1	65/55	65/5 5
Operating temperature range	℃	0–40						
Ambient temperature for batteries (recommended)	℃	20–25						
Storage temperature	℃	-25–+70						
Storage time for batteries at ambient temperature		Max. 6 months						
Max. installation altitude (above sea level)	m	1000 m (3300 ft) without power reduction						
Power reduction factor for installation altitudes above 1000 m (above sea level) in accordance with IEC 62040-3		Height above sea level (m / ft)				Power reduction factor		
		1500/4850				0.95		
		2000/6600				0.91		
		2500/8250				0.86		
		3000/9900				0.82		
Relative humidity		Max. 95% (non condensing)						
Accessibility		The complete front side is accessible for service and maintenance (no access from the side, the back or from the top is necessary)						
Installation		Min. 20 cm clearance behind the UPS (required because of the fan)						
Input/output cable connection		At the front at the bottom						
AC-AC efficiency up to (for cosphi 1.0) (depending on the module type)	%	Load:	100%	75%	50%	25%		
		HPD 24-40:	94.5%	94.5%	94%	93%		
		MPD 8-20:	94%	94%	93.5%	91%		
Efficiency for linear load at cosφ = 0.8 and Efficiency for non-linear load in accordance with (EN 62040-1-1:2003)		Typically up to 1% higher than the above values Typically up to 1% lower than the above values						
Eco-mode efficiency at 100% load	%	98%						

30. Standards

Safety	EN 62040-1-1:2003, EN 60950-1:2001/A11:2004						
Electromagnetic compatibility (EMC)	EN 62040-2:2005, EN61000-3-2:2000, EN6100-3-3:1995/A1:2001, EN61000-6-2:2001, EN61000-6-4:2001						
EMC classification	MPD -88	MPD -12	MPD -16	MPD -20	HPD -24	HPD -32	HPD -40
Emission class	C1	C1	C1	C2	C2	C2	C2
Immunity class	C1	C2	C2	C3	C3	C3	C3
Configuration	EN62040-3:2001						
Product certification	CE						
Degree of protection	IP 20						

31. Communication

Power Management Display (PMD)	1 x LCD display for each module
RS232 serial interface (Sub-D9)	2x in the system enclosure + 1x at each module (Smart Port) For the monitoring and the integration in the network management
USB	1x for monitoring and management software
Customer interfaces: Inputs X1 (DRY PORTS)	1 emergency off [remote shutdown (normally closed)] 1 generator operation (normally open) 2 programmable customer inputs (normally open) 1 temperature sensor input for battery charging control
Customer interfaces: Outputs X2 , X3, X4 (DRY PORTS)	10 x potential-free contacts (relay contacts) For remote signalling and automatic computer shutdown
Rack-mounted unit for SNMP adaptor card	SNMP adaptor card (optional) For the monitoring and the integration in the network management
Rack-mounted unit for Newavewatch TM	Newavewatch card (optional) for Premium Power Protection

Table 48: Communication

31.1. Power Management Display (PMD)

The user-friendly PMD consists of three parts: MIMIC DIAGRAM, CONTROL KEYS and the LCD that displays the required monitoring information for the UPS.

31.2. Overview Diagram

The mimic diagram shows the general operating state of the UPS. The LED displays show the energy flow and change for mains failure or load switching from inverter to bypass and vice versa and changes the colour from green (normal) to red (warning). The LINE 1 (rectifier) and LINE 2 (bypass) LEDs show the availability of the mains power supply. If the INVERTER and BYPASS LEDs illuminate green, they indicate which of the two sources is supplying the critical load. If the BATTERY LED display illuminates, this indicates that because of mains failure the battery is supplying the load. The ALARM display is an optical warning that indicates some internal or external alarm situation. The buzzer also sounds.

31.3. Display

The 2 x 20-character display simplifies the communication with the UPS. The menu-controlled LCD provides access to the EVENT MEMORY, the monitoring of the input and output values for U, I, f, P, autonomy and other measurements, and also the execution of commands such as activation and deactivation of the inverter or the switching of the load from INVERTER to BYPASS and vice versa, and the DIAGNOSIS (SERVICE-MODE) operation for settings and tests (for further details, refer to the User's Manual).

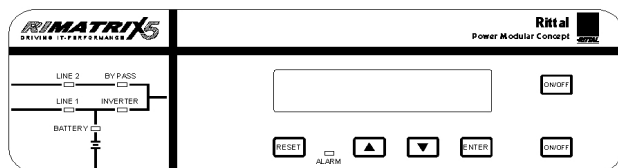


Fig. 35: Display

32. Customer Interfaces (Connection Terminal Blocks X1....X4)

32.1. Customer Inputs (DRY PORT): Connection Terminal Block X1

This terminal block is used to connect devices with remote-controlled shutdown, generator operation, customer special options, emergency off (*refer to the manual, Chapter 23/OPTIONS*).

32.2. Customer Outputs (DRY PORT): Connection Terminal Blocks X2, X3, X4

Provision of signals for the automatic and proper shutdown of servers, AS400 or process-controlled building monitoring systems.

All contacts disconnected from the power are nominal 60 VAC max. and 500 mA max.

All interfaces are equipped with Phoenix spring-loaded connections for cables with 0.5 mm² cross-section.

Customer Interfaces

(Connection Terminal Blocks X1....X4)

EN

Block	Connection	Contact person	Signal	On the display	Function
X1	X1 / 1		+ 3.3 Vdc		EMERGENCY OFF (remote shutdown)
	X1 / 2		GND		(do not remove the factory-installed jumper until the external EMERGENCY OFF has been correctly wired)
	X1 / 3		+ 3.3 Vdc		Generator operation
	X1 / 4		GND		(NC = Generator ON)
	X1 / 5		+ 3.3 Vdc		Customer input IN 1
	X1 / 6		GND		(function defined on request)
	X1 / 7		+ 3.3 Vdc		Customer input IN 2
	X1 / 8		GND		(function defined on request)
	X1 / 9		+ 3.3 Vdc		Battery temperature input
	X1 / 10		GND		(if connected; battery charging current depends of the battery temperature)
X2	X2 / 1		ALARM	MAINS_OK	Mains is present
	X2 / 2				Mains failure
	X2 / 3				Shared cable
	X2 / 4		Message	LOAD_ON_INV	Load at inverter
	X2 / 5				(load at mains bypass)
	X2 / 6				Shared cable
	X2 / 7		ALARM	BATT_LOW	Low battery voltage
	X2 / 8				Battery OK
	X2 / 9				Weight
	X2 / 10		Message	LOAD_ON_MAINS	Load at bypass (mains)
X3	X3 / 1		Message		(load at inverter)
	X3 / 2				Shared cable
	X3 / 3		ALARM	COMMON_ALARM	General alarm (system)
	X3 / 4				No alarm state
	X3 / 5				Shared cable
	X3 / 6		ALARM	MODUL_ALARM1	Module 1 alarm
	X3 / 7				No alarm state
	X3 / 8				Shared cable
	X3 / 9		ALARM	MODUL_ALARM2	Module 2 alarm
	X3 / 10				No alarm state
X4	X4 / 1		ALARM		Shared cable
	X4 / 2			MODUL_ALARM3	Module 3 alarm
	X4 / 3				No alarm state
	X4 / 4		ALARM		Shared cable
	X4 / 5			MODUL_ALARM4	Module 4 alarm
	X4 / 6				No alarm state
	X4 / 7		ALARM		Shared cable
	X4 / 8			MODUL_ALARM5	Module 5 alarm
	X4 / 9				No alarm state
	X4 / 10				Shared cable

Table 49: Phoenix spring-loaded connections (X1...X4)

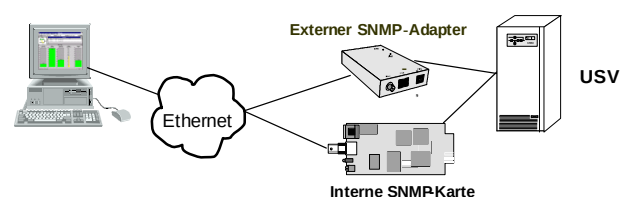
33. Options

- Modem/Ethernet card or Modem/GSM card for Newavewatch™ management software
- SNMP card and Rittal UPS Management software, Modbus protocol
- External battery enclosures
- Parallel bus for additional UPS enclosures
- Input/output transformers for special voltages
- Larger battery charging units for larger batteries
- Temperature sensor for checking the battery temperature

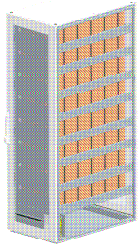
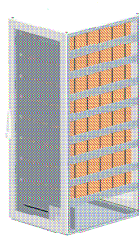
33.1. SNMP Card / Rittal UPS Management Software

The Simple Network Management Protocol (SNMP) is a worldwide-standardised communications protocol. It is used to monitor every device in the network using a simple control language. The Rittal UPS Management software also makes the data available in SNMP format using an internal software package. The operating system that you use must support the SNMP protocol. We offer our Rittal UPS Management software with SNMP functionality for Novell, OS/2, all Windows that run on INTEL and ALPHA, DEC VMS, Apple computers.

Two types of SNMP interfaces with identical function are available: an external SNMP adaptor (box) and an internal SNMP card. Both can manage the parallel system (N Module) and output either general values that are uniform for the complete parallel system or specific values for individual modules.



33.2. BATTERY ENCLOSURES

BATTERY ENCLOSURES			
Configuration:	Max.	120 battery blocks x 24/28 Ah on 8 shelves 3x5=15 blocks/shelf	150 battery blocks x 24/28 Ah on 8 shelves 7x 4 each 5+1x 2 each 5=30
Battery fuses / max. batt. line: Terminals:	S-Type	3/3 (terminals 9x 16/25 mm ²)	5/5 (terminals 15x 16/25 mm ²)
Battery fuses / max. batt. line: Terminals:	C-Type	3 / 3 + shared connection connectors 3x (2x M8) +PE 2x M8	5 / 5 + shared connection connectors 3x (2x M10) +PE 2x M10
Protection (fast-acting)	A	3x 100 A	5x 100 A
Dimensions (WxHxD)	mm	600x2000x1000	800x2000x1000
Weight without trays and without batteries	kg	316	376
Battery configuration for each battery enclosure		Battery configuration 30x 28 Ah 40x 28 Ah 50x 28 Ah (2x 30) x 28 Ah (2x 40) x 28 Ah (2x 50) x 28 Ah (3x 30) x 28 Ah (3x 40) x 28 Ah	Battery configuration (2x 40) x 28 Ah (3x 40) x 28 Ah (4x 40) x 28 Ah (5x 40) x 28 Ah (2x 50) x 28 Ah (3x 50) x 28 Ah (4x 50) x 28 Ah (5x 30) x 28 Ah (5x 40) x 28 Ah

34. Battery Autonomy Times

34.1. MD Modules (Medium Power Density): Configuration Examples for Internal Battery

Module types		MPD 8	MPD 12	MPD 16	MPD 20
Separate battery for each module		Battery autonomy in minutes per module			
Enclosure type	Battery/module (up to three modules in the Triple-75 enclosure)	10 kVA / 8 kW	15 kVA / 12 kW	20 kVA / 16 kW	25 kVA / 20 kW
PMC Plus-60	40x7 Ah / 9 Ah	8 / 14	5 / 8		
PMC Plus-60	50x 7 Ah / 9 Ah	11 / 18	7 / 11		
PMC Plus-60	(2x 30) x 7 Ah / 9 Ah	14 / 23	8 / 14	6 / 9	
Shared battery configuration		Battery autonomy in minutes for the complete system			
with one module	Module type	1 x MPD 8	1 x MPD 12	1 x MPD 16	1 x MPD 20
	Total system power	10 kVA / 8 kW	15 kVA / 12 kW	20 kVA / 16 kW	25 kVA / 20 kW
PMC Plus-60	(2x 40) x 7 Ah / 9 Ah	21 / 33	12 / 20	8 / 14	6 / 10
PMC Plus-60	(2x 50) x 7 Ah / 9 Ah	28 / 43	16 / 26	11 / 18	8 / 14
PMC Plus-60	(3x 40) x 7 Ah / 9 Ah	35 / 54	21 / 33	14 / 23	11 / 23
PMC Plus-60	(3x 50) x 7 Ah / 9 Ah	47 / 1h 12 minutes	28 / 43	19 / 30	14 / 23
with two modules	Module type	2 x MPD 8	2 x MPD 12	2 x MPD 16	2 x MPD 20
	Total system power	20 kVA / 16 kW	30 kVA / 24 kW	40 kVA / 32 kW	50 kVA / 40 kW
PMC Plus-60	(2x 40) x 7 Ah / 9 Ah	8 / 14	5 / 8		
PMC Plus-60	(2x 50) x 7 Ah / 9 Ah	11 / 18	7 / 11		
PMC Plus-60	(3x 40) x 7 Ah / 9 Ah	14 / 23	8 / 14	6 / 9	
PMC Plus-60	(3x 50) x 9 Ah	30	18	13	9
with three modules	Module type	3 x MPD 8	3 x MPD 12	3 x MPD 16	3 x MPD 20
	Total system power	30 kVA / 24 kW	45 kVA / 36 kW	60 kVA / 48 kW	75 kVA / 60 kW
PMC Plus-60	(2x 40) x 7 Ah / 9 Ah	5 / 8			
PMC Plus-60	(2x 50) x 7 Ah / 9 Ah	7 / 11			
PMC Plus-60	(3x 40) x 7 Ah / 9 Ah	8 / 14	5 / 8		
PMC Plus-60	(3x 50) x 9 Ah	18	11	8	6

Battery Autonomy Times

EN

34.2. MPD Modules (Medium Power Density): Configuration Examples for External Battery

This configuration is normally used in combination with the PMC Extend 125 enclosure.

Module type		MPD 8	MPD 12	MPD 16	MPD 20
Separate battery for each module		Battery autonomy in minutes per module			
Battery module (for up to five modules)	Battery/module	10 kVA / 8 kW	15 kVA / 12 kW	20 kVA / 16 kW	25 kVA / 20 kW
1x CBAT-DPA-200	30x 28 Ah	37	22	15	
1x CBAT-DPA-200	40x 28 Ah	54	32	22	17
Shared battery configuration		Battery autonomy in minutes for the complete system (4+1)			
	Module type	4 x MPD 8	4 x MPD 12	4 x MPD 16	4 x MPD 20
Battery enclosure	Total system power	40 kVA / 32 kW	60 kVA / 48 kW	80 kVA / 64 kW	100 kVA / 80 kW
1x CBAT-DPA-120	50x 28 Ah	12			
1x CBAT-DPA-120	(2x 50) x 28 Ah	30	18	12	9
1x CBAT-DPA-120	(3x 40) x 28 Ah	37	22	15	12
1x CBAT-DPA-200	(3x 50) x 28 Ah	50	30	21	15
1x CBAT-DPA-200	(4x 50) x 28 Ah	72	43	30	22

34.3. HPD Modules (High Power Density): Configuration Examples for Internal Battery

Module types		HPD 24	HPD 32	HPD 40
Separate battery for each module		Battery autonomy in minutes per module		
Enclosure type	Battery/module (up to three modules in the Triple-150 enclosure)	30 kVA / 24 kW	40 kVA / 32 kW	45 kVA / 40 kW
PMC Plus120	(2x 40) x 9 Ah	8	6	
Shared battery configuration		Battery autonomy in minutes for the complete system		
with two modules	Module type	2 x HPD 24	2 x HPD 32	2 x HPD 40
	Total system power	60 kVA / 48 kW	80 kVA / 64 kW	90 kVA / 80 kW
PMC Plus120	2x (2x 40) x 9 Ah	8	6	
PMC Plus120	3x (2x 40) x 9 Ah	14	9	7
with three modules	Module type	3 x HPD 24	3 x HPD 32	3 x HPD 40
	Total system power	90 kVA / 72 kW	120 kVA / 96 kW	135 kVA / 120 kW
PMC Plus120	3x (2x 40) x 9 Ah	8	6	

34.4. HPD Modules (High Power Density): Configuration Examples for External Battery

This configuration is normally used in combination with the PMC Extend 200 enclosure.

<i>Module type</i>		<i>HPD 24</i>	<i>HPD 32</i>	<i>HPD 40</i>
Separate battery for each module		Battery autonomy in minutes per module		
<i>Battery module</i> (for up to five modules)	Battery/module	30 kVA / 24 kW	40 kVA / 32 kW	45 kVA / 40 kW
1x CBAT-DPA-200	40x 28 Ah	13	9	7
Shared battery configuration		Battery autonomy in minutes for the complete system (4+1)		
with four modules	<i>Module type</i>	4 x HPD 24	4 x HPD 32	4 x HPD 40
	<i>Total system power</i>	120 kVA / 96 kW	160 kVA / 128 kW	180 kVA / 160 kW
1x CBAT-DPA-120	(3x 40) x 28 Ah	9	6	
1x CBAT-DPA-200	(3x 50) x 28 Ah	12	9	
1x CBAT-DPA-200	(4x 50) x 28 Ah	18	12	9
2x CBAT-DPA-200	5x (2x 40) x 28 Ah	43	30	22

35. Installation Planning and Assembly of the UPS System

Free space	X	Y
Minimum	200 mm	900 mm

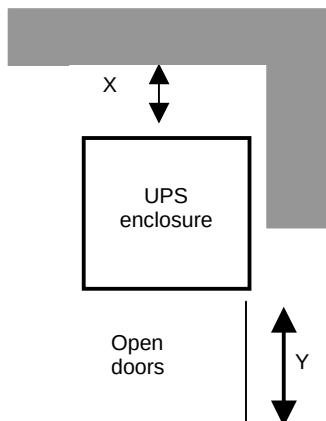


Fig. 36: UPS space requirement (recommended)

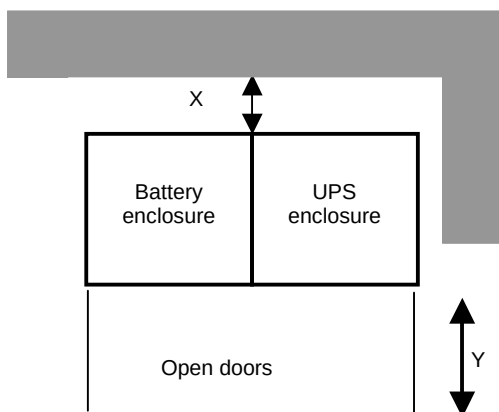


Fig. 37: UPS + recommended space requirement for the battery

Installation Planning and Assembly of the UPS System

EN

UPS enclosure type (75 kVA up to 125 kVA)	PMC Plus-60	PMC Extend 100
Dimensions (WxHxD) mm	600 x 2000 x 1000	600 x 2000 x 1000
UPS enclosure type (150 kVA up to 250 kVA)	PMC Plus-120	PMC Extend 200
Dimensions (WxHxD) mm	800 x 2000 x 1000	800 x 2000 x 1000
Battery enclosure type	CBAT DPA-120	CBAT DPA-200
Dimensions (WxHxD) mm	600 x 2000 x 1000	800 x 2000 x 1000
Accessibility	The complete front side is accessible for service and maintenance (no access from the side, the back or from the top is necessary)	
Installation	Min. 20 cm clearance behind the UPS (required because of the fan)	
Input/output cable connection	At the front at the bottom	

35.5. Heat Loss Per Module with Non-linear Load

Module selection		MPD				HPD		
Module types		MPD 8	MPD 12	MPD 16	MPD 20	HPD 24	HPD 32	HPD 40
Heat loss for 100% non-linear load per module (EN 62040-1-1:2003)	W	600	900	1200	1500	1670	2225	2780
Heat loss for 100% non-linear load per module (EN 62040-1-1:2003)	BTU	2047	3070	4094	5118	5698	7592	9485
Cooling air quantity (25° - 30°C) for non-linear load (EN 62040-1-1:2003)	m³/h	150	150	150	150	380	380	380

Wiring and Block Diagram for all Enclosures and Modules

EN

36. Wiring and Block Diagram for all Enclosures and Modules

The user of the UPS system must connect it with cables to the input distributor and output distributor. The inspection of the installation, the commissioning of the UPS and the additional battery enclosures may be performed only by qualified service personnel authorised by the manufacturer. Further details and notes are contained in the UPS manual.

36.1. Circuitry Overview (Connection Terminals)

Enclosure type Terminals (T) Busbars (B)	Separate. Battery (+ / N / -) +PE	Shared battery (+ / N / -) +PE	Bypass input 3+N	Rectifier input 3+N+PE	Load output 3+N+PE
PMC Plus-60	9+1 x 16/25 mm ² (T)	3 x M6 (B) +PE 1 x 16 mm ² (T)	4 x 35/50 mm ² (T)	4x 35/50 mm ² (T) +PE 50 mm ² (T)	4x 35/50 mm ² (T) +PE 50 mm ² (T)
PMC Extend-100	15+1 x 16/25 mm ² (T)	3 x M10 (B) +PE 1 x 50 mm ² (T)	4 x 70/95 mm ² (T)	4 x 70/95 mm ² (T) + PE 50 mm ² (T)	4 x 70/95 mm ² (T) + PE 50 mm ² (T)
PMC Plus-120	9+1 x 16/25 mm ² (T) +PE 1 x M10 (B)	3 x M10 (B) +PE 1 x M10 (B)	3 x M10 (B) +PE 1 x M10 (B)	4 x M10 (B) +PE 1 x M10 (B)	4 x M10 (B) +PE 1 x M10 (B)
PMC Extend-200	15 x 16/25 mm ² (T) +PE 1 x M12 (B)	3 x M12 (B) +PE 1 x M12 (B)	3 x M12 (B) +PE 1 x M12 (B)	4 x M12 (B) +PE 1 x M12 (B)	4 x M12 (B) +PE 1 x M12 (B)

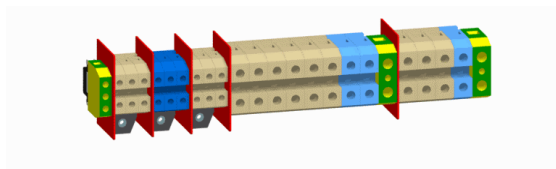


Fig. 38: PMC Plus 60

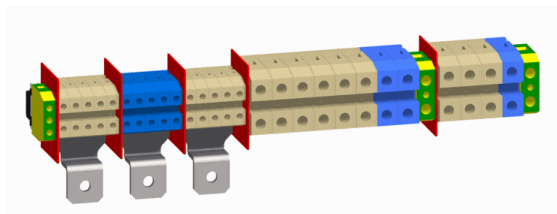


Fig. 39: PMC Extend 100

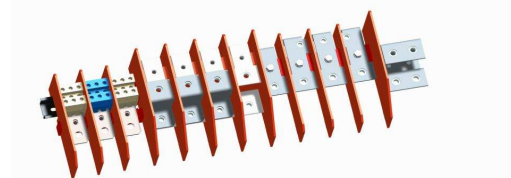


Fig. 40: PMC Plus 120

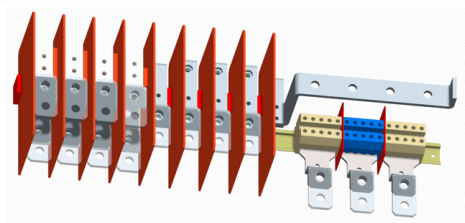


Fig. 41: PMC Extend 200, separate supply

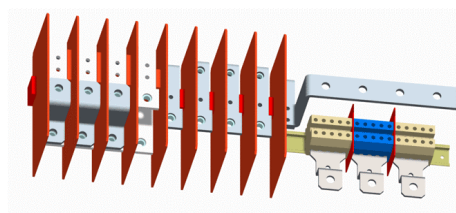


Fig. 42: PMC Extend 200, shared supply

Wiring and Block Diagram for all Enclosures and Modules

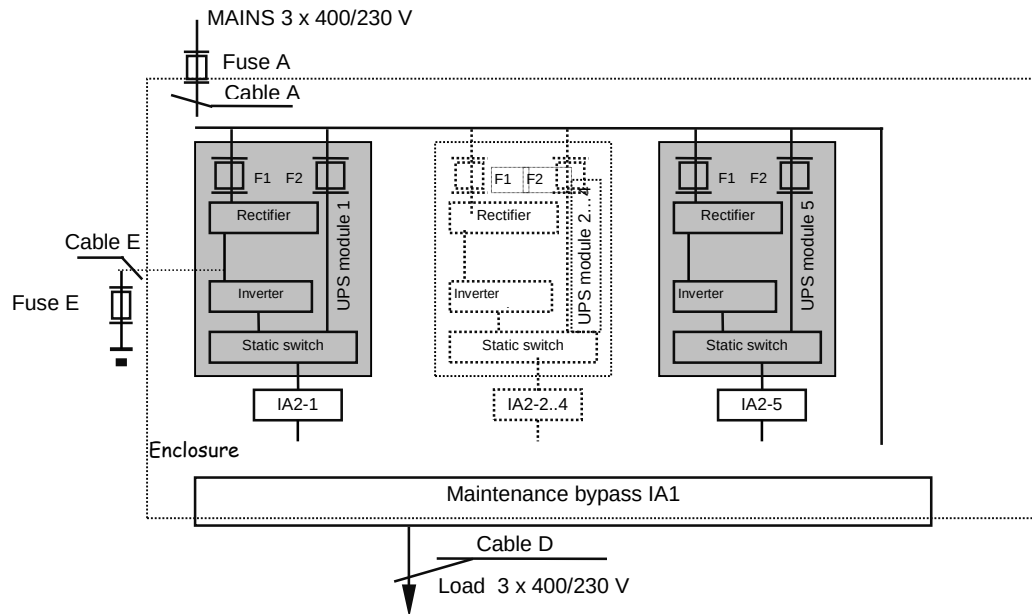
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36.2. Single Feed Input



Note!

The cable selection and fuses are recommended values. Local standards must be observed.



Block diagram 3: Standard Version (single feed input)

Wiring and Block Diagram for all Enclosures and Modules

EN

Enclosure	Load in	Input 3x 400 V			Output 3x 400 V cosphi 0.8			Battery	
		Fuse A (Agl/CB)	Cable A (mm ²) (IEC 60950-1:2001)	Max. input current with discharged battery (A)	Cable D (mm ²) (IEC 60950-1:2001)	In (A)	Fuse E + / N / - (Agl/CB)	Cable E (mm ²) only for CBAT DPA 120 or 200 + / N / -	
								Shared battery	Separate battery
(Enclosures should be wired for the full end power)									
PMC Plus-60	75	3x 125 A	5x 50	101	5x 50	108 A	3x 160 A*1	3x 50	3x (3x 10)
PMC Extend 100	125	3x 225 A	5x 95	169	5x 95	181 A	3x 260 A*1	3x 120	5x (3x 10)
PMC Plus-120	150	3x 250 A	5x 120 or 5x (2x 50)	202	5x 120 or 5x (2x 50)	218 A	3x 300 A*1	3x 150	3x (3x 25)
PMC Extend 200	250	3x 400 A	5x (2x 95)	337	5x (2x 95)	362 A	3x 500 A*1	3x (2x 150)	5x (3x 25)
Other intermediate power levels (recommendation: to allow a future power expansion, the enclosures listed above should be wired for the appropriate full end power)									
	10	3x 20 A	5x2.5	13	5x2.5	14 A	3x 32 A	3x4	
	15	3x 25 A	5x4	20	5x4	22 A	3x 63 A	3x10	
	20	3x 40 A	5x6	27	5x6	29 A	3x 63 A	3x10	
	30	3x 63 A	5x10	40	5x10	43 A	3x 80 A	3x16	
	40	3x 80 A	5x25	54	5x25	58 A	3x 100 A*	3x25*	
	45	3x 100 A	5x25	68	5x25	65 A	3x 125 A*	3x35*	
	60	3x 100 A	5x25	81	5x25	87 A	3x 125 A*	3x35*	
	80	3x 125 A	5x50	108	5x50	116 A	3x 160 A*	3x50*	
	90	3x 160 A	5x50	121	5x50	130 A	3x 200 A*	3x70*	
	100	3x 160 A	5x50	135	5x50	145 A	3x 224 A*	3x95*	
	120	3x 200 A	5x70	161	5x70	174 A	3x 250 A*	3x120*	
	160	3x 250 A	5x120 or 5x (2x 50)	215	5x120 or 5x (2x 50)	232 A	3x 350 A*	3x (2x70)*	
	200	3x 315 A	5x185 or 5x (2x 70)	267	5x185 or 5x (2x 70)	290 A	3x 450 A*	3x (2x95)*	

*1 valid only for shared battery

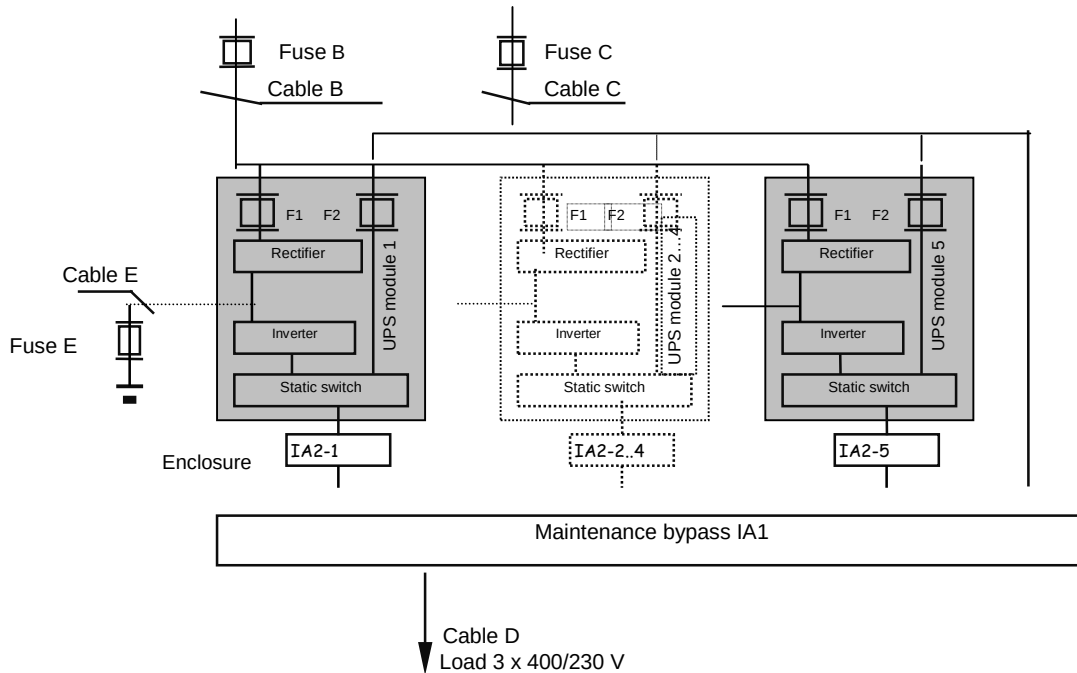
Table 50: Overview of the electrical data

36.3. Dual Feed Input



Note!

The cable selection and fuses are recommended values. Local standards must be observed.



Block diagram 4: Version with Dual Feed Input

Wiring and Block Diagram for all Enclosures and Modules

EN

Enclosure type	Load in kVA at cosphi 0.8	Input 3x 400 V			Bypass 3x 400 V		Output 3x 400 V cosphi 0.8		Battery		
		Fuse B (Agl/CB)	Cable B (mm ²) (IEC 60950-1:2001)	Max. input current with discharged battery (A)	Fuse C (Agl/CB)	Cable C (mm ²) (IEC 60950-1:2001)	Cable D (mm ²) (IEC 60950-1:2001)	In (A)	Fuse E +/N/- (Agl/CB)	Cable E (mm ²) only for CBAT DPA 120 or 200 + / N / -	
										Shared battery	Separate battery
(Enclosures should be wired for the full end power)											
PMC Plus-60	75	3x 125 A	5x 50	101	3x 125 A	4x 50	5x 50	108 A	3x 160 A*1	3x 50	3x (3x 10)
PMC Extend 100	125	3x 225 A	5x 95	169	3x 225 A	4x 95	5x 95	181 A	3x 260 A*1	3x 120	5x (3x 10)
PMC Plus-120	150	3x 250 A	5x 120 or 5x (2x 50)	202	3x 250 A	4x 120 or 4x (2x 50)	5x 120 or 5x (2x 50)	218 A	3x 300 A*1	3x 150	3x (3x 25)
PMC Extend 200	250	3x 400 A	5x (2x 95)	337	3x 400 A	4x (2x 95)	5x (2x 95)	362 A	3x 500 A*1	3x (2x 150)	5x (3x 25)
Other intermediate power levels (recommendation: to allow a future power expansion, the enclosures listed above should be wired for the appropriate full end power)											
	10	3x 20 A	5x2.5	13	3x 20 A	4x2.5	5x2.5	14 A	3x 32 A	3x4	
	15	3x 25 A	5x4	20	3x 25 A	4x4	5x4	22 A	3x 63 A	3x10	
	20	3x 40 A	5x6	27	3x 40 A	4x6	5x6	29 A	3x 63 A	3x10	
	30	3x 63 A	5x10	40	3x 63 A	4x10	5x10	43 A	3x 80 A	3x16	
	40	3x 80 A	5x25	54	3x 80 A	4x25	5x25	58 A	3x 100 A*	3x25*	
	45	3x 100 A	5x25	68	3x 100 A	4x25	5x25	65 A	3x 125 A*	3x35*	
	60	3x 100 A	5x25	81	3x 100 A	4x25	5x25	87 A	3x 125 A*	3x35*	
	80	3x 125 A	5x50	108	3x 125 A	4x50	5x50	116 A	3x 160 A*	3x50*	
	90	3x 160 A	5x50	121	3x 160 A	4x50	5x50	130 A	3x 200 A*	3x70*	
	100	3x 160 A	5x50	135	3x 160 A	4x50	5x50	145 A	3x 224 A*	3x95*	
	120	3x 200 A	5x70	161	3x 200 A	4x70	5x70	174 A	3x 250 A*	3x120*	
	160	3x 250 A	5x120 or 5x (2x 50)	215	3x 250 A	4x120 or 4x (2x 50)	5x 120 or 5x (2x 50)	232 A	3x 350 A*	3x (2x 70)*	
	200	3x 315 A	5x185 or 5x (2x 70)	267	3x 315 A	4x185 or 4x(2x70)	5x 185 or 5x (2x 70)	290 A	3x 450 A*	3x (2x 95)*	

*1 valid only for shared battery

Table 51: Overview of the electrical data

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